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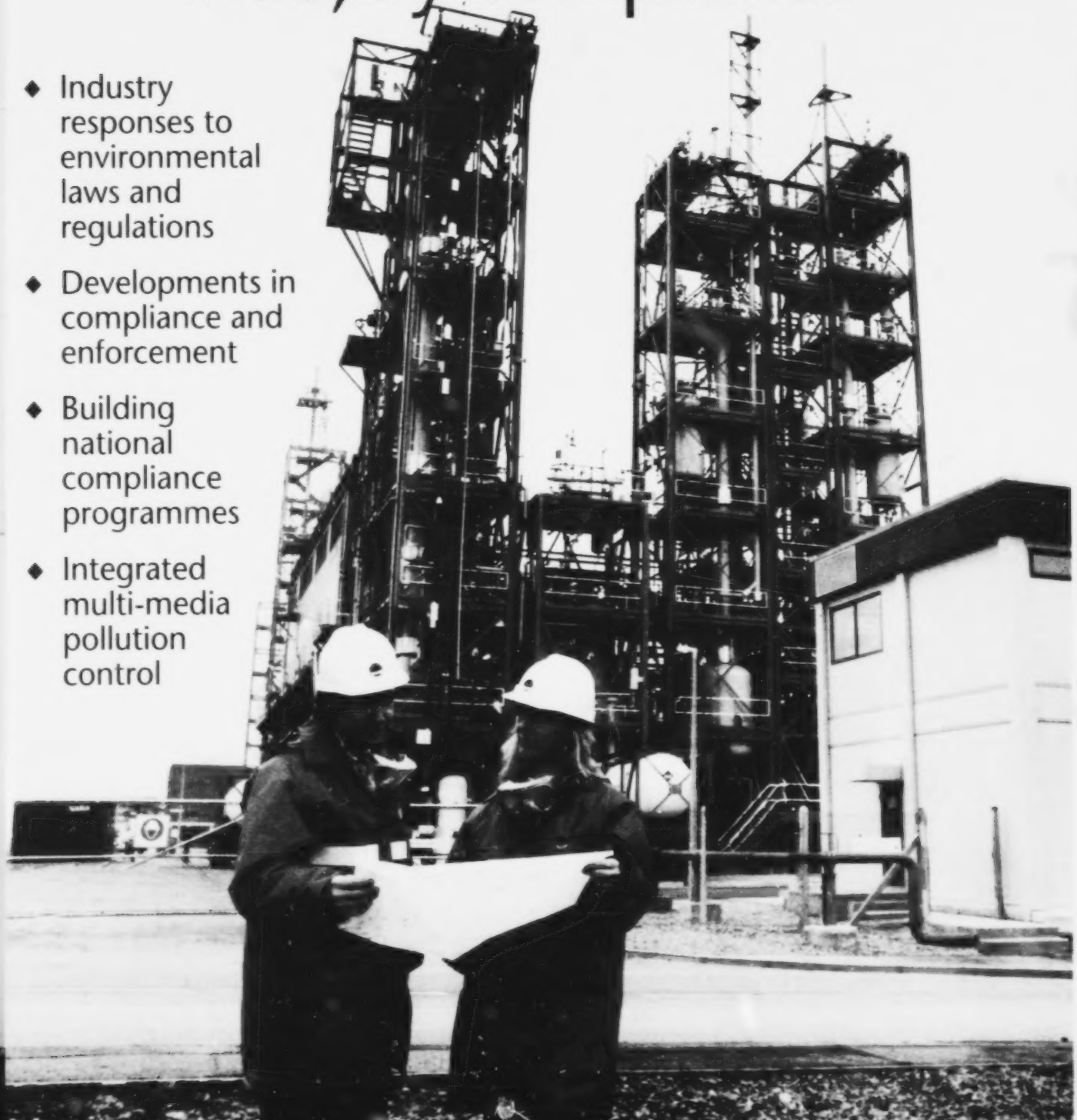
Industry compliance

- Industry responses to environmental laws and regulations
- Developments in compliance and enforcement
- Building national compliance programmes
- Integrated multi-media pollution control



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Industry compliance for sustained environmental protection

Governments have the responsibility of providing the overall framework needed to help society achieve sustainable development. One of the intended effects of environmental laws and regulations is to provide a level playing field for industry, so that it can contribute to a better quality of life without depleting resources or damaging the environment and jeopardizing current and future generations' health and economic well-being. Over the last three decades, national legal frameworks concerned with environmental protection have become almost universal; the body of international environmental law is also growing significantly.

But environmental laws and regulations are only words on paper if they are not implemented, complied with, and – where necessary – enforced. Governments must therefore devote resources to that end. Without such commitment, government agencies lose credibility and the ability to achieve more widespread compliance and related sustainable development. Non-compliance in turn signals to the public that environmental protection does not have a high priority. Further, long-term economic health often depends on environmental protection measures that may not seem to be economically advantageous in the short run, but which would result in economic and social benefits in the long run. Finally, enforcement action taken when companies do not comply with requirements can help ensure fairness for those who do.

An effective industrial compliance and enforcement programme requires governments to take a number of discrete but linked actions. Compliance should be considered when environmental laws and regulations are framed, as it will be difficult to achieve if they are unenforceable or incomprehensible. Good communication with industries likely to be affected can also help improve eventual compliance.

Economic instruments should be chosen carefully in order to maximize compliance. Environmental performance can be improved by a judicious mix of such instruments, including incentives as well as restrictions. In some cases, "command and control" regulations have not worked well in the past. Consideration should be given to other approaches, such as voluntary or negotiated agreements and market-based policy instruments.

As soon as an environmental law or regulation is in place, an effective compliance and enforcement programme should be set up. Such a programme needs to incorporate several elements. The first is attention to permitting systems. Permitting is the foundation for achieving effective industry compliance. It involves detailed discussions with companies in order to arrive at an agreed decision on how they may operate and on the measures they will need to take to comply with environmental standards. The permit then becomes the practical benchmark against which compliance can be measured.

The second element in a compliance and enforcement programme is verification that industry is meeting the conditions of permits, and therefore complying with the broader aims of the environmental laws or regulations on which they are based. Verification may be accomplished through monitoring and through inspections of company facilities. Both tasks require governments to ensure an adequate supply of well trained and well supported expert personnel.

The third element involves the variety of measures that can be taken to encourage or compel compliance. This element is particularly important where non-compliance is blatant or could cause serious damage to health or the environment. In such cases legal enforcement measures, including appropriate penalty systems, are needed. However, a number of other means of ensuring compliance are available that do not involve resorting to legal penalties.

Compliance and enforcement programmes are thus a central part of successful environmental policies. Attention to their effective and sustained implementation can make a big difference to the overall success of efforts to protect the environment.

Whether operating established programmes or setting up new ones, governments should also pay attention to new trends and to new opportunities for maximizing compliance and its effectiveness. One such area is the emerging multimedia, integrated approach. Environmental laws, and corresponding compliance and enforcement schemes, have often been designed to tackle a single-medium problem such as solid waste or water and air pollution. But this division of the environment into separate media fails to recognize that pollutants move from one medium to another. It also tends to encourage end of pipe controls such as treatment plants, filters and scrubbing, which not only leads to transfer of pollutants between media but also to high investment costs with no economic pay-back. And it leads to added paperwork, administrative complexity, and sometimes inconsistency. This is why integrated approaches encouraging the adoption of cleaner technologies and preventive measures in industrial facilities, and at the same time often resulting in a greater administrative efficiency, are being increasingly adopted.

Moreover, many countries have ratified international agreements including the Montreal Protocol on Substances that Deplete the Ozone Layer, the Basel Convention on the Transboundary Movement of Hazardous Wastes, and the Framework Convention on Climate Change. These countries have to reflect their commitments in national environmental laws and, when these laws concern industrial activities, make sure they are complied with.

In practice, many factors affect the extent to which compliance with environmental requirements is achieved: there are social, moral and personal influences, as well as economic factors, to be taken into account. The underlying goal of a compliance and enforcement programme should be promotion and encouragement of compliance rather than punishment. To create an atmosphere in which most of the regulated community chooses to comply, it is essential that there are effective awareness-raising and educational activities, a system of incentives for those who comply, and information systems to help industry identify solutions available to meet environmental standards.

Ensuring compliance is not the job of governments alone. Industry managers also have an important role to play. They need to install self-monitoring systems that can easily be checked by inspectors and develop internal environmental management systems, in particular auditing and reporting schemes.

ISO 14000 will be a useful tool in that respect. Dialogue between government, industry, and the public at large is a key element for successful compliance and sustained environment protection.

UNEP is assisting in a number of ways. In 1992, it issued the report *From Regulations to Industry Compliance: Building Institutional Capabilities*". The corresponding training manual was published this year. UNEP has also taken an active part in the biannual conference series on "environmental compliance and enforcement" organized by the governments of the Netherlands and the United States.

In support of these activities, this issue of *Industry and Environment* focuses on four important current issues related to industry compliance: the special needs and opportunities of developing countries; compliance with international environmental agreements; making the move from single- to multi-media permitting; and effective verification. ◆

Developments in compliance and enforcement management

Rob Glaser, Ministry of Housing, Spatial Planning and the Environment, Inspectorate General International Affairs, P.O. Box 304, 4330 AJ Middelburg, the Netherland

Abstract

This article describes the major elements in the management of compliance and enforcement, using a simple figure explaining the regulatory process. Developments in rapidly industrializing countries are highlighted. In these countries, institutional arrangements to cope with the demand for better control of the environment are not in place or not fully developed. In more developed countries, on the other hand, there is political pressure on regulatory authorities to reduce their workforce, reduce governmental influence, minimize costs, and at the same time continue to improve the environment in many areas.

Résumé

Cet article présente les principaux éléments de la gestion de la conformité des industries, en se référant à une figure simple expliquant le processus de réglementation. Il met en exergue les développements observés dans les pays en voie d'industrialisation rapide. Les dispositions institutionnelles qui permettraient à ces pays de répondre aux exigences d'un meilleur contrôle de la pollution n'ont pas encore été mises en place ou sont encore insuffisamment développées. Dans les pays industrialisés, où de telles dispositions existent, les organes de réglementation sont soumis à des pressions politiques visant à comprimer leurs effectifs, modérer l'influence des gouvernements, réduire les coûts et en même temps améliorer l'environnement dans de nombreux domaines.

Resumen

Este articulo describe los elementos principales en la gestión del cumplimiento y su ejecución, utilizando una ilustración sencilla que explica el proceso regulador. Se hace hincapié en los adelantos realizados en los países con industrialización rápida. En estos países, los acuerdos institucionales para satisfacer la necesidad de un mayor control del medio ambiente no funcionan correctamente o bien no se han desarrollado por completo. En los países más desarrollados, donde dichos acuerdos funcionan, se ejerce una presión política sobre las autoridades de regulación para que éstas reduzcan su fuerza de trabajo, con el fin de disminuir la influencia gubernamental, minimizar los costes y, al mismo tiempo, mejorar el medio ambiente en numerosas esferas.

Introduction

Developments in the rapidly industrializing countries are highlighted in this article. Authorities in these countries are struggling to keep pace with industrial activities, as institutional arrangements to cope with the demand for better control of the environment are either not in place or are underdeveloped. In the more developed countries, where institutional arrangements are in place, political pressure is being put on regulatory authorities to reduce their workforce, reduce governmental influence and minimize costs, while at the same time improving the environment.

Innovative approaches such as care systems, covenants, and environmental management systems therefore need to be explored. Among the challenges to regulatory authorities is the need to give as much responsibility as possible to the polluting industry itself, without losing the ability to enforce compliance.

The regulatory cycle (**Figure 1**) is a simple figure which explains the regulatory process. It has been used extensively to assist governmental agencies in charge of managing the enforcement process to develop strategies. It helps them work, in a systematic way, towards a compliance and enforcement programme that will include structured feedback (**Figure 2**).

The regulatory cycle shows clearly the sequential steps of the various segments. Activities within the segments are interrelated, and a missing or underdeveloped element immediately affects the segment that follows. For example, inadequate permitting affects monitoring and enforcement activities. Compliance promotion is only effective if permitting can be used as a control mechanism. Compliance checking and monitoring are only effective if inspection systems are in place and the consequences of non-compliance can be adequately addressed in follow-up activities. Where non-enforceable regulations have been promulgated, feedback may lead to adjustments of the legal framework. Feedback to the permitting organizations may lead to changes in permitting conditions to make them more easily enforceable.

The need to work in a programmatic way

Lawmakers need regular feedback to fine-tune, adjust, and/or upgrade existing regulations. Sometimes drastic corrections of existing regulations are necessary in order to achieve the goals set for the improvement of the environment. The only way to obtain reliable input data is to compile these data in a programmatic way. Since *ad hoc* collection of data rarely produces sufficient evidence to justify changes in regulations, compliance and enforcement programmes need to be worked out and executed.

The institutions in charge of systematic compilation of data need to employ well-qualified and properly trained staff. Institutional arrangements need to be capable of handling the compliance and enforcement load and have proper independent operational capabilities. Regular public reporting of results not only contributes to the justification of these institutions' existence, but also helps attract political support for change.

Enforceable permitting conditions are a prerequisite for success. This might seem obvious, but permits or authorizations are often not scrutinized for enforceability even in systems with sophisticated procedures and conditions. Many conditions do not stand up in court because they are unclear and sometimes misleading. Words with misleading and subjective meanings include: *clean, prevent, possible, vicinity, reliable, smokeless, almost, sufficient, noxious smells,* and *fire-resistant.*

Systematic compliance checking

Compliance checking is carried out in several ways, sometimes according to an (annual) programme, sometimes on an *ad hoc* basis when specific problems need to be addressed. Systematic compliance checking is sometimes done industry-by-industry for larger and more complicated facilities, sometimes branch-by-branch for smaller and medium-sized industries. These two types of compliance checking need to be executed in an integral way in order to cover all sectors of the environment. Performance in areas that are not directly environment-related, such as bookkeeping, accounting, and even management systems, also needs to be checked.

Across an industry, compliance checking occurs when, for example, emissions data from boilers are checked for conformity with specific country-wide regulations. Thorough preparation always precedes checking of the selected industry or group of industries. Often, especially when

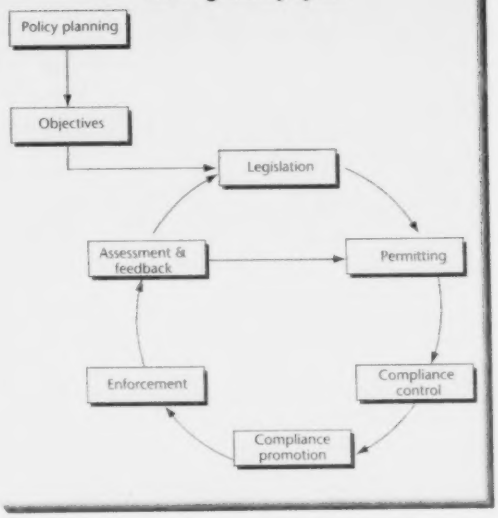
branch-type investigations are carried out, use is made of guidelines in order to develop checklists that take account of the application and permitting requirements of a particular industry. A decision on what is considered important for the environment must be established beforehand, so that the major points of the investigation and follow-up can be determined.

A strict protocol of preparation, on-site visit, and reporting must be adhered to, and a code of conduct must be applied to all investigators (or inspectors) to give credibility to the investigations they perform. Consistency in reporting and follow-up must be maintained at all times.

Examples of systematic compliance checking are branch-type investigations of medium and small-sized industries, mostly carried out using integral approaches to the industries visited (tanneries, galvanizing or textile enterprises, garages, foundries, etc.). Sometimes systematic investigation of a special unit operation is carried out across an industry, for example on all boilers to check efficiency and SO_x and NO_x emissions data.

Systematic compliance checking will reveal difficulties with the enforceability of regulations and/or conditions and reveal cases of non-compliance. Compliance checking needs proper policy backing which can be applied promptly and consistently. A strategy to cope with non-compliance situations is also needed.

Figure 1
The regulatory cycle



Compliance promotion

Compliance checking consists merely of investigation and recording. The next step is to achieve compliance in cases of non-compliance. Convincing the violator to comply, rather than immediately proceeding with legal enforcement measures, is the preferred route. This compliance promotion route serves a number of purposes – it saves time and effort in court actions, and it is known from experience that once the offender has been convinced the violation is unlikely to recur. It should be made clear from the very beginning, however, what will happen if non-compliance continues. The consequences must be sufficiently serious, and a point of no return may be reached if the offender takes too long to rectify the situation. Court actions and penalties will then result. This system is generally applied in either a one- or two-step approach, corresponding to the one or two "on-site" visits that occur before the final enforcement approach is used.

Compliance promotion may also be required when a new regulation comes into force. On many occasions a transition period is announced to introduce and disseminate a regulation. The announcement and publication of the new regulation is necessary, but not at all sufficient. The transition period should allow time to make sure target groups are properly informed. Trade organizations could take the lead in informing their members. The national press and environmental magazines have a role to play, too.

The better informed the regulated community is, the faster non-compliance can be rectified by the authorities – since it can be shown that the violator ought to have known compliance was required.

It is not always necessary, and sometimes it is unwise, to use a two-step approach. For example, in the case of obvious and willing non-compliance, especially where sizeable economic advantages are gained through failure to comply, the enterprise has clearly shown fraudulent intentions.

The enforcement response

The enforcement response, once a properly structured programme of compliance promotion has failed, will irrevocably entail court procedures. Temporary shutdowns of operating units or other penalties will be put into effect until non-compliance has been corrected. Negotiations and deals with the public prosecutor in an attempt to escape official court actions should be avoided, as this generally erodes the credibility of a compliance and enforcement programme.

Once the court procedures have begun, negotiations between the parties should be avoided. Only the judge or high authority should determine the final verdict and penalty. Enterprises have already had the opportunity to take corrective measures during the compliance promotion stage. Authorities should take care to establish their case against the management of an enterprise before entering the court procedures. It is extremely important to be reasonably sure that the verdict will be in their favour. Otherwise, a loss of credibility will result. Especially at the beginning of a systematic compliance and enforcement programme, when judges and/or magistrates are not yet familiar with environmental issues, only WIN cases should be brought to court.

Public awareness of the results of enforcement actions is very useful in discouraging potential violators.

Feedback mechanisms

As shown in Figure 1, systematic compliance and enforcement programmes trigger the feedback mechanism. The information derived from the enforcement response, compliance promotion efforts, and compliance checking need to be assessed either during the legislative/regulatory stage or directly at the permitting stage. It is essential that experiences are passed on, and that the regulatory process can continue into the next cycle for further improvement (see Figure 2).

Integrated permitting

Most permitting systems in the world today aim at integrated permitting, meaning the granting of one permit by the authorities regarding all aspects of the environment (e.g. air, water, noise, waste, risk).

The first step in integrated permitting is to coordinate the time schedules and information required for sectoral permitting procedures, and to appoint one authority to be in charge of coordination. The integrated authorization or permit will consist of a number of sectoral permits combined in one.

This excellent starting point (the "one window" approach) is only the beginning of efforts aimed at achieving a truly integral environmental permit. It will still take a long time for that goal to be reached. Other evaluation tools and mechanisms need to be developed fully or introduced, such as life-cycle analysis (LCA), eco-management and audit schemes (EMAS), and environmental care systems.

Compliance verification

It may be possible for all permits given to an enterprise to be thoroughly checked by the authorities that delivered them. Often, especially at large facilities, this type of "integral checking" is quite a burden for the authorities. They not only have to check the conditions described in the permit, but also in many cases compile information on commitments made by the enterprise at the time it applied. It is advantageous for all parties involved if the enterprise has an integral permit based on an integrated permit application, as this simplifies the checking procedures considerably.

In view of the authorities' responsibility to verify compliance in a consistent and credible way, often with limited resources, a number of ways to reduce their work load may be considered. The first way is to simplify data collection by prescribing self-monitoring and record-keeping by the enterprise. The second is automatic reporting and compilation of these data using telemetric systems. A centralized data processing system enables authorities to monitor the actual performance of the enterprise with respect to critical emission data. Regular verification of emission data gathered through self-monitoring by certified laboratories, paid by the enterprise but with an obligation to report to the authorities, helps provide the overview of data needed to determine compliance at major emission points.

Some restraint is necessary by the permitting authorities, who should limit self-monitoring and reporting obligations. The type of data collected

should serve a clear objective not only for the policy-makers, but also the enterprise if possible.

In the case of violations established through self-monitoring, corrective measures should follow pre-established procedures already known to the enterprise and supported by the judicial system.

Environmental audits

Environmental audits are basic management tools comprising a systematic, documented, periodic and objective evaluation of how well an enterprise's procedures, management systems and equipment are performing. The aim of the audit is to facilitate management control of environmental practices and to enable the company to assess compliance with its own environmental policies, including satisfying regulatory requirements. As can be inferred from this definition, an environmental audit covers more areas than do permits. It includes accounting (bookkeeping) and a survey of the state-of-the-art in the processes used. The audit is basically an internal management appraisal report.

The audit report compares the results with the permit conditions or application forms. Both the facts and figures of the authorization granted (compliance check) and the reliability of the data are examined. The added value in comparison to integrated compliance verification and enforcement lies in the signaling of areas for possible improvement, which are left open to management and the authorities to cover in the follow-up. Environmental management is analysed as well. Environmental audits may be carried out by special task forces of the authorities, or by certified consultants paid by the enterprise.

Environmental care systems

Once the enterprise realizes the importance of environmental issues, including its own societal responsibility, the time has come for it to adopt the principle of environmental care. Management feels obliged to use all its technical and managerial skills to work towards the continuous improvement of the environment. The enterprise reduces the load to the environment not only in order to comply with the permitting system, but of its own free will. This not only applies to its site, but also the fate of its products and the raw materials used. A voluntary LCA shows that its product is also environmentally acceptable, from cradle to grave.

Environmental care covers the full product cycle. Responsibility is no longer shifted to others (producers or consumers). A certification system for environmental care systems needs to be developed, in close cooperation with industry, and verified by an independent organization.

When such a care system has been implemented, authorities will be relieved of a certain amount of in-depth compliance-checking. Only spot-checking of very critical items will still be required. The company will provide regular public reports on the state of the environment and possible means of improvement.

If authorities (mis)use these reports to prescribe improvements, or make them compulsory, there is a danger of the care system being eroded.

Covenants

A covenant is a kind of "gentlemen's agreement". One party may be a trade organization or group of large industries, or even a single specific industry, and the other party the regulatory authority. Between them, they agree to execute an action plan to handle certain environmental problems. These plans normally fit into a national master plan. The authorities leave implementation to the other party, as long as it fulfills the conditions of the covenant. However, authorities should always have a contingency plan in case the agreement fails. The "carrot and stick" approach should not be abandoned.

Covenants have been developed in countries where it has been realized that a system for ensuring compliance by enterprises (one by one) is not a long-term option. It would be impossible for the authorities to carry the full responsibility of compliance checking and promotion. Rapid changes in environmental requirements, to be implemented by all industry at the same time, cannot be organized and controlled by a permitting agency. Nor can industries react instantly to new conditions. They need time to optimize. The advantage of covenants for certain sectors of industry is a degree of freedom to choose the best way to achieve the government's goals without much interference by the authorities. The latter, however, must keep track of the performance of the covenant partner through obligatory regular reporting. In case agreements fail, they will need to step in with a permitting system.

The use of covenants in the Netherlands is still at the stage of a try-out exercise. It fits into the philosophy that industry should take responsibility for the environment. As long as the programme of the covenant is followed, the authorities will not intervene in detail in the implementation process. If some members do not wish to cooperate, the government could step in within the framework of an existing permitting system. There will always be a need for some form of control, but it can be administered in a programmatic way or even on an *ad hoc* basis. Covenants will not replace permitting, nor will they eliminate compliance and enforcement programmes. A less rigid control system might be anticipated, however, once it has been shown that an industry can implement the covenant goals.

Approaches for developing countries

The ultimate goal of the regulatory cycle (Figure 1) is to achieve full compliance with laws, regulations and permitting conditions and, at the same time, enable authorities to correct and improve regulations in order to continue to protect the environment. Ideally, all permitting should be carried out using the "one window" approach, with an integrated permitting procedure covering all environmental impacts in a single permit. An integrated permit not only satisfies the wish of industry to avoid the struggle to comply with a number of different permits, but also that of governments to optimize the use of scarce resources.

The outcome of this coordinated/integrated procedure is the best solution to the pollution problems presented in the permit application. In this way, shifting pollution from one sector to another may be avoided. Relatively simple compliance checking and upgrading of the quality of the permits might then become feasible.

The implementation of the regulatory cycle would meet most problems in developing countries, as these problems are mainly of an infrastructural nature. Budgetary and human resource limitations are abundantly present, not to speak of the political whims of policy-makers and frequent staff changes.

Most countries have what is called "framework" laws to start with. In many countries, sectoral approaches are in place and enterprises have to apply for permits individually. The best approach is to coordinate these separate applications using strict time schedules, and to establish a central body in charge of the coordinated permitting process, which will receive these applications. This coordinating body could be an agency (within a ministry or a separate body), a provincial body, or even the administrative organism of an industrial estate. The terms of reference of this body should at a minimum include coordinating time schedules for the permitting process. The advantage is that industry knows exactly what to do, where to go, and what to deliver.

Permitting systems for developing countries

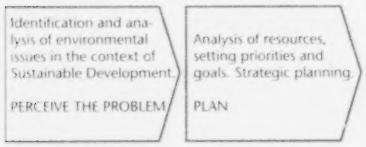
The permitting process can be structured and simplified through standardization of procedures and conditions for groups of enterprises. Most of the work of issuing permits to medium and small enterprises can be performed using this standardized system. Once it is in place, a compliance and enforcement programme can be developed and maintained. The best approach to standardizing permit conditions is to begin with available guidelines on the type of enterprise that will be regulated. The next step is to develop a checklist addressing the main environmental issues and the subjects that need to be addressed in the permit to be issued. The third step is to test in practice whether the subjects on the checklist are well-covered and whether prescriptions are really necessary. Prescriptions should be enforceable in practice and should really serve a purpose. The number of prescriptions should be kept to the minimum. Verification of enforceability in particular is a prerequisite for successful future compliance and enforcement programmes. An adequate number of facilities need to be examined before a final set of prescriptions can be issued.

If branch organizations exist in countries, involving these organizations might be the best way to gain support and to disseminate results. All enterprises in the country active in a particular field must be informed and treated in the same way, to avoid unfair competition.

A similar approach can be followed for so-called "unit operations" such as boilers, furnaces, and dust collectors (bag filters, cyclones, etc.) as well as sewage treatment plants. Efficiencies or loads to be achieved can be clearly specified.

What should be in a permit?

A permit is in essence a contract between the authorities and the enterprise. It can be drawn up in many different ways. In developing countries, where there is generally a lack of human and financial resources, the permit conditions should be very simple and compliance checking should be unsophisticated. Visual checking should be the usual method of verifying compliance. For example, to check whether a scrubber is working, examining


Identification and analysis of environmental issues in the context of Sustainable Development.
PERCEIVE THE PROBLEM
Analysis of resources, setting priorities and goals. Strategic planning.
PLAN

the pump circulating the washing liquid will often be sufficient. If it is not clear whether the desired efficiency has been achieved, this is nevertheless the price to pay for not being able to carry out an efficiency test every time a check is required. The lack of human resources and money for laboratory tests limits the possibilities. To overcome these problems, more self-monitoring, better bookkeeping, and checking by certified laboratories could be prescribed. It should be kept in mind, however, that the conditions should be fair (economically) and justified (environmentally) and not entail costs disproportionate to the value of the information provided. For example, prescribing self-monitoring of the particle size distribution of dust from a bag filter system is not justified where steady operational conditions exist and the same feedstock and products are produced. Simple pressure drop measuring equipment and bookkeeping concerning the purchase and maintenance of the bag filter provide sufficient information on performance.

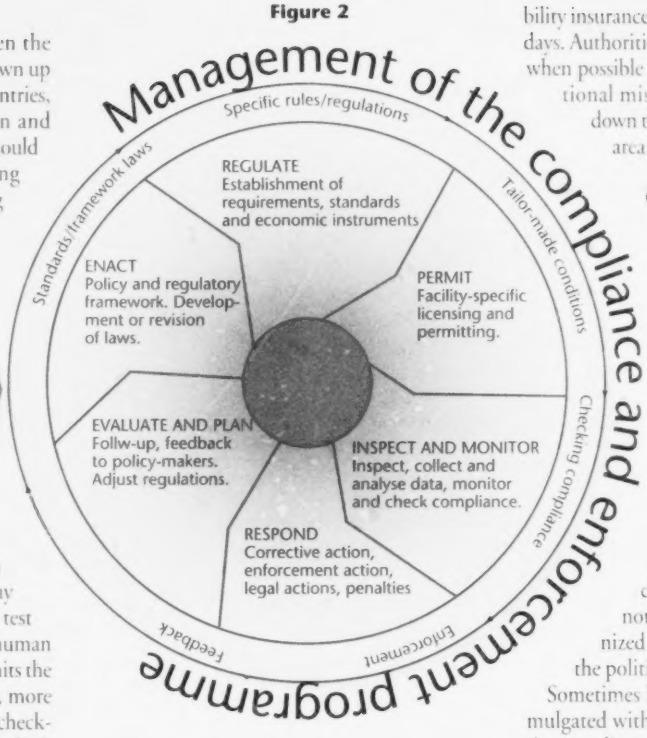
Sampling points and monitoring

If accurate measurements are required, monitoring (either self-monitoring or monitoring by authorities) of sampling points should be properly defined and installed.

In cases where flow measurements are necessary, fixed flow metering equipment should be installed whenever possible. Regular recording of flows is necessary for data collection. Compositions also need to be analysed for major contaminants regularly, with more detailed analyses by certified laboratories.

Testing procedures and analyses should not be described *in extenso*, but should refer to standardized methods of analysis. An accurate reference to international or national testing methods should be made. It is advisable to define the limits of the permit precisely, while using repeatable and reproducible methods. This is to avoid discussion in court of whether exceeding the prescribed limit was related to the testing method.

Figure 2



The polluter-pays principle should be adhered to, with the authorities verifying compliance.

The costs incurred by the authorities in providing an enterprise with the needed permits is seldom recovered. Cost recovery might, however, be considered in the following cases:

- In many countries the costs of *permit applications and permitting procedures* are calculated on a fixed percentage of the capital investment of the enterprise, irrespective of the actual work performed by the authorities.
- If routine compliance checking programmes are agreed upon as part of the permit, the costs of *compliance checking* are then paid by the enterprise. These compliance checks should be executed by a certified agency under the supervision of the permitting authority.
- The cost of *regular and agreed monitoring* will be paid by the enterprise if the frequency of monitoring and the components to be analysed are prescribed in the permit.
- Once an investigation is carried out in the framework of an *enforcement action*, authorities should bear the costs themselves. Costs of enforcement actions are not generally recoverable. Only when the enforcement response culminates in a penalty can the cost sometimes be recovered in principle. In many countries, however, the law does not allow sufficient recovery of the cost of the enforcement response and the community has to foot the bill. To cover the cost of enforcement actions, a surcharge, to be paid annually by all enterprises, could be considered.
- The cost of *rehabilitation and clean-up* should be fully recoverable through civil procedures. Liability insurance is a hot item for enterprises nowadays. Authorities should even prescribe insurance when possible in permits, to cover future operational mishaps or even the cost of closing down the enterprise and rehabilitating the area.

Condoning

Condoning, or letting the polluter off, is the "road to all evil" in the enforcement system.

In many countries condoning is so widespread that hardly any enforcement takes place and a very relaxed attitude to the rules prevails.

In very rare cases, and with many restrictions and full publicity and political support, condoning can be considered, but not without additional conditions. Examples are cases in which the relevant laws are not enforceable and this fact is recognized by the authorities and known to the politicians and to the public at large.

Sometimes laws and new regulations are promulgated without giving enterprises reasonable time to adjust. Sometimes the regulation does not allow for a transition period at all. In these cases, the authorities might also consider a condoning decision in which a strict timetable, and control and reporting obligations with a number of checkpoints, are to be observed. It should also be made clear what repercussions will follow in case of non-compliance once the condoning period has passed.

Inspectors

Last but not least, the conditions in permits have to be checked by inspectors. Inspection organizations are an integral part of the government's responsibility to verify that the regulations they have established are working. The government also has the obligation to lawmakers to show that the laws are properly enforced and that the policies they set out are (or are not) achieving their goals.

The inspection system and organization must be set up in such a way that they can achieve the goals of the inspection. Verification, correction of violations, and feedback to lawmakers are the main aspects of implementation.

In some countries the inspectors in charge of issuing permits are also verifying compliance at the same enterprises. In countries where well-qualified officials are scarce, combined permitting and verification is understandable but not advisable. It is obvious that a potentially "condoning" type of attitude could be the result.

Inspectorates should be given full independence in carrying out their inspections and in reporting to the highest political responsible entity. Reporting should also be made public. This ideal situation has not yet been reached, however, in many countries. ◆

Building domestic environmental compliance and enforcement programmes and networks for international exchange: a progress report

Cheryl E. Wasserman, Associate Director for Policy Analysis, Office of Federal Activities, Office of Enforcement and Compliance Assurance, US EPA (MC-2251-A), Washington,D.C. 20460, USA

Abstract

There is widespread international agreement on the importance of maintaining environmental compliance and enforcement programmes if environmental protection, sustainable development, free trade, and cleaner production goals are to be achieved. Common definitions and principles, and a common framework, provide a basis for international exchange. The Fourth International Conference on Environmental Compliance and Enforcement will be held at Chiang Mai, Thailand, in April of this year. UNEP is one of the sponsors. Elizabeth Dowdeswell, Executive Director of UNEP, will deliver the keynote address.

Résumé

Il est important de continuer à mettre en oeuvre des programmes de conformité aux réglementations environnementales si l'on veut atteindre les objectifs de protection de l'environnement, de développement durable, de libre échange, et de production plus propre. Ce point de vue fait l'objet d'un large consensus international. Des définitions, des principes et un cadre communs constituent une base pour les échanges internationaux. La quatrième conférence internationale sur le contrôle de la conformité environnementale des industries se tiendra à Chiang Mai, en Thailande, en avril de cette année. Le PNUE en est l'un des promoteurs.

Resumen

Existe un extenso acuerdo internacional sobre la importancia de mantener programas de cumplimiento y apoyo ambiental, si se quieren alcanzar objetivos relacionados con la protección ambiental, el desarrollo constante, el libre comercio, y una producción más limpia. Las definiciones y los principios comunes, junto con un marco de trabajo común, proporcionan una base para el intercambio internacional. La Cuarta Conferencia Internacional sobre Cumplimiento y Ejecución ambiental se celebrará en Chiang Mai, Tailandia, en Abril de este año. UNEP es uno de los patrocinadores.

A highly successful international collaboration to build effective environmental compliance and enforcement programmes, share experiences, and foster cooperation is leaving a lasting legacy. The most recent of four international meetings will be held at Chiang Mai, Thailand, in April 1996. It is significant not only as a one-time event, but also as an indication of the progress made in little over a decade. There is now formal international consensus on the importance of environmental compliance and enforcement programmes dedicated to the achievement of environmental protection and sustainable development, free trade, and cleaner production goals. A common framework, and common definitions and principles, provide a basis for international exchange.

This international network has grown from 13 to over 100 countries and international organizations, with hundreds of experts accessible via a databank. Materials developed and widely disseminated in order to help others develop new, or enhance existing, compliance and enforcement programmes include several volumes of conference proceedings, technical documents, and six capacity-building support documents.

New institutional arrangements have emerged over the past decade for regional and international networking and cooperation. This article provides a brief overview of what international partnership has been able to achieve, the materials and expertise available, and ways to continue progress into the next century. Perhaps we could begin by asking:

What do these countries have in common?

Nigerians were outraged when they read newspaper articles about a farmer and his wife who were found dead after innocently accepting an illegal shipment of hazardous waste from another country for disposal on their farmland, leading to the creation of one of Africa's first environmental enforcement divisions.

The Netherlands continues to beef up its programme for detecting illegal shipments when radioactive waste materials mingled in metal scrap and tubing come into the country illegally. However, it finds itself handling political hot potatoes when illegal shipments of hazardous chemicals that have passed through its busy Rotterdam harbour wind up in countries which want to send them back.

Guyana is responding to toxic chemical waste from gold mining, and Barbados to the disposal of offensive waste in the pristine Caribbean waters which have long been an important tourist attraction. These countries have set up compliance monitoring and enforcement schemes to protect their resources.

Forests in Honduras are threatened, but the forest reserves set up to protect them have been decimated through theft and by a local population in need. The military has been used for surveillance, and economic incentive and enforcement programmes and new strategies for forest management have been developed.

The skies of the Monongahela River Valley in the United States, a centre for iron and steel production, were blackened by thick clouds laden with toxic air pollutants. Faced with serious economic hardship and an industry in decline, this area introduced creative compliance schedules in enforcement negotiations. Environmental, economic and social concerns had to be balanced. However, new technologies have been developed and applied over many years of trial and error.

Heavy industry in Poland has left a legacy of pollution problems that may undermine efforts to privatize and to renew economic health, but officials have nevertheless been able to link clean-up with sales and to enhance existing inspectorate activities with new enforcement tools.

Mexico has taken very visible action to shut down facilities with longstanding compliance problems. At the same time, a programme of government environmental audits gives a second chance to those who respond quickly to compliance problems.

Santa Rosa County in California, a US community known for its environmental values, found that its numerous automobile repair shops were discharging volatile organics (oils and gaso-

line) into the sewers, causing the wastewaster treatment plant to violate air pollution requirements. The backlash from initial efforts to enforce environmental standards led to a programme which creatively mixes incentives with enforcement, using the power of the marketplace to reward those in compliance. It includes multimedia, multi-programme inspection and a limited time in which to correct the problems discovered.

Norway began monitoring compliance through an inspection programme, but lacked expertise and resources. It found that it could develop expertise over time and use third parties paid for by industry inspection fees to leverage its limited resources.

Chile, which is seeking new free trade status, wants to start a compliance and enforcement programme. Debates surrounding the North American Free Trade Agreement have centred on concerns for a level playing field and the enforcement of environmental laws, but Chile's resources and expertise are limited.

These countries all need to find effective approaches to obtain compliance with environmental requirements using limited resources. And they need to address the realities of competing economic and social concerns.

An increasing number of governmental and non-governmental officials are not just talking, but doing. The genesis and rationale for the growing support for effective environmental compliance and enforcement programmes can be traced through a series of international meetings and their antecedents.

The beginning of international compliance and enforcement networks

In 1985, two events provided a foundation for international compliance and enforcement efforts. First, the Group of Economic Experts of the Organisation for Economic Cooperation and Development (OECD) commissioned three national case studies (using the United States, the Netherlands, and the United Kingdom) on improving the efficiency and effectiveness of compliance monitoring and the enforcement of environmental policies. Discussions made it clear that few countries examined the extent to which they had achieved compliance with environmental policies and requirements. Furthermore, even the term "enforcement" had widely different meanings. Some included *any* act involving implementation of the legislative scheme, even issuing permits and/or offering subsidies. In only a few instances did these programmes focus on efforts to change behaviour once requirements were established, whether through legislation, regulations or permits. Nevertheless, the three national case studies received wide circulation and led the way to further exchanges. There was agreement that the polluter-pays principle would not be realized if laws were not enforced or if requirements were not implemented.

In the same year, the United States Environmental Protection Agency (US EPA) and the Netherlands' Ministry of Housing, Spatial Planning and the Environment (VROM) entered into a Memorandum of Understanding (MOU) to promote mutual exchange of information and ideas. Environmental enforcement was singled out for exchange activities. This MOU led to a series of seminars in the United States which were attended by Dutch officials from all levels of government and from several different national agencies.

Box 1

Agenda 21, Chapter 8, Section (e) 8.21, establishes an international mandate to build compliance and enforcement capacity as an essential element of environmental management:

(e) Develop effective national programmes for reviewing and enforcing compliance with national, state, provincial and local laws on environment and development

8.21. Each country should develop integrated strategies to maximize compliance with its laws and regulations relating to sustainable development. The strategies could include:
(a) Enforceable, effective laws, regulations and standards that are based on sound economic, social and environmental principles and appropriate risk assessment, incorporating sanctions designed to punish violations, obtain redress, and deter future violations;
(b) Mechanisms for promoting compliance;
(c) Institutional capacity for collecting compliance data, regularly reviewing compliance, detecting violations, establishing enforcement priorities, undertaking effective enforcement, and conducting periodic evaluations of the effectiveness of compliance and enforcement programmes;
(d) Mechanisms for appropriate involvement of individuals and groups in the development and enforcement of laws and regulations on environment and development.

The **First International Enforcement Workshop**, which was held in Utrecht, the Netherlands, in May 1990, was the first attempt by the US and Dutch governments to broaden the bilateral exchanges begun in 1985. Representatives from 13 countries and international organizations attended what was still an extension of these bilateral talks. Papers were presented on developments in Sweden, Germany and Poland, as well as the European Community. Domestic programme management and strategies, and domestic enforcement of international agreements, were themes explored.

From these initial talks emerged the beginnings of a common international framework, with definitions and principles.

This framework covered seven elements:
- creating requirements that are enforceable;
- knowing who is subject to the requirements and setting programme priorities;
- promoting compliance in the regulated community;
- monitoring compliance;
- responding to violations;
- clarifying roles and responsibilities;
- evaluating the success of the programme and holding programme personnel accountable for its success.

At the beginning of 1991, Poland's Ministry of Environmental Protection, Natural Resources and Forestry provided a unique opportunity to go a step further. Drawing on international experiences shared at the International Workshop in order to offer a rich menu of options for ways to develop programmes, and on the "Principles of Environmental Enforcement" text and associated training exercises, role-playing and case-study materials were developed in cooperation with both Poland's Environment Ministry and VROM to arrive at enforcement training with broad international applicability. The training course has now been translated into nine languages.

One of the most important recommendations of the participants at the International Workshop was that enforcement should appear on the agenda at the United Nations Conference on Environment and Development in June 1992. Although enforcement was not specifically a topic at UNCED, Agenda 21, Chapter 8, Section (e) 8.21, established an international mandate to build compliance, compliance monitoring, and enforcement capacity as an essential element of environmental management, starting with ensuring that laws and regulations are enforceable (see **Box 1**).

The language in Agenda 21 empowered UN organizations to support compliance and enforcement institution-building activities more actively. Public accountability provided by such governmental programmes was underpinned by support for a strong public role in decision-making. Of equal significance were related initiatives by the business community to support compliance with environmental requirements. Organizations such as the International Chamber of Commerce and the Business Council for Sustainable Development presented consensus statements on the need for more effective environmental management.

The Second International Conference in Budapest: increasing participation

The Second International Conference on Environmental Enforcement, held in Budapest in September 1992, implemented a second important recommendation of participants at the International Workshop, which was to hold another conference in two years with broader sponsorship and participation. The European Commission joined VROM and US EPA. The Executive Planning Committee included UNEP, the Regional Environmental Centre, the governments of Poland, Hungary, and what was then Czechoslovakia, and the World Wildlife Fund, the first NGO involved. Participants included 138 governmental and non-governmental officials from 38 countries and international organizations.

Box 2
Special topics addressed at the four international meetings for which papers and discussion summaries are available

- Automation and enforcement: available support systems (4th)
- Strategic targeting for enforcement (4th)
- Strategies, tools and management systems (1st)
- Integrated permitting and enforcement (4th)
- Compliance monitoring (2nd, 4th)
- Role of police in enforcement (3rd)
- Promoting voluntary compliance: environmental auditing, outreach and incentive programmes (3rd, 4th)
- Measures of success (1st, 4th)
- Communications and enforcement (2nd, 3rd, 4th)
- Public role in enforcement: how to go about creating and supporting citizen enforcement (2nd, 3rd, 4th)
- Criminal enforcement: INTERPOL, role of criminal enforcement of environmental enforcement programmes (3rd, 4th)
- Enforcement of economic instruments (3rd, 4th)
- Take-back laws enforcement (4th)
- Creating enforceable permit programmes and requirements
- General, hazardous and solid waste (2nd)
- Focus on water pollution and contamination of drinking water supplies (4th)
- Transboundary illegal shipments/imports and exports of hazardous waste, toxic chemicals, contaminated products, pesticides, contraband CFC (1st, 2nd, 3rd)
- Montreal Protocol: enforcement of CFC and related requirements (1st, 3rd, 4th)
- Enforcing domestic programmes implementing international agreements (1st, 4th)
- Establishing international networks (3rd, 4th)
- Collaborative international targeting of enforcement (4th)
- Organizing and financing programmes (3rd, 4th)
- Intergovernmental enforcement relationships (1st)
- Enforcement policy and authorities (1st, 2nd, 4th)
- Field citation and related administrative enforcement programmes (3rd)
- Enforcing the law at government owned or operated facilities (2nd, 3rd)
- Enforcing in economically depressed circumstances/areas (2nd, 3rd)
- Privatization as an opportunity to enhance compliance (2nd)

Numbers reflect meetings at which the topics were discussed and papers and discussion summaries were available.

Holding the Conference in one of the capitals of Central and Eastern Europe, whose governments and economies were in transition, emphasized that the rule of law and the credibility of governmental institutions are essential to create the stability needed for investment and the correction of years of environmental degradation. Stringent environmental laws and standards cannot be effective without enforcement and incentive programmes that compel and encourage compliance. Creating an atmosphere of deterrence in which compliance is the norm is not easy when violations of the law are commonplace. Given the role of the public in bringing about political and economic changes in these countries, and the importance of public support to create the political will necessary to enforce environmental laws in difficult economic circumstances, a key theme at the Conference was the role of the public in supporting and pursuing enforcement.

Because of the success of the training course within Central and Eastern Europe, the framework, definitions and principles from the "Principles of Environmental Enforcement" were accepted as a basis for international exchange at the Budapest Conference. Participants were virtually unanimous in pushing for a Third Conference that would presuppose the "Principles of Environmental Enforcement" and focus on opportunities to explore, in small group discussions, the application of these principles, as well as possibilities for institution-building assistance in setting up or improving enforcement programmes.

The Third International Conference in Oaxaca: reaching out to developing countries

In 1992, UNEP published *From Regulations to Industry Compliance: Building Institutional Capabilities*.[2] This report was designed to provide government officials and others with guidance on building institutional capabilities to implement their environmental laws using an integrated approach, so that waste and pollutants are not simply transferred between environmental compartments but are actually reduced at the source. The importance of legally binding environmental standards, and of verifying that these standards are met, was stressed.

Examples of countries' experiences were selected to show that incremental steps can be taken with even minimal personnel and resources when there is sufficient political will. Requests to UNEP from officials in developing countries and countries with economies in transition to help apply the concepts and integrated approaches outlined in the 1992 publication resulted in the development of UNEP's institution-building workshops for industrial compliance. These workshops were developed with the assistance of the Netherlands, in cooperation with the US EPA. An Advisory Committee with members from Mexico, France, Egypt and Poland helped ensure the usefulness of workshop materials to developing countries and countries with economies in transition. A draft manual, consisting of four case studies with facilitation materials, was presented at the Third International Conference in Oaxaca, Mexico, in 1994. Picking up where the "Principles of Environmental Enforcement" leave off, it addressed four subjects:

- the organization of permitting, compliance monitoring and enforcement programmes;
- the human, financial and information resources for the above programmes;
- permitting processes for industrial facilities to enhance compliance;
- compliance monitoring and enforcement capability.

Prior to the Third Conference, one official commented that enforcement of environmental laws was a "luxury that only rich nations can afford". By the end of the Conference, however, there was little doubt that enforcement is a luxury few could afford to do without. One way or another, we pay. The bill for preventable environmental pollution must be paid with interest.

Sponsorship of the Third Conference in Oaxaca included UNEP Industry and Environment (UNEP IE), the World Wildlife Fund (WWF), and Mexico's SEDESOL. There was also support from Canada. The Executive Planning Committee included the sponsors plus Costa Rica, Chile, Venezuela, Jamaica, Nigeria and Indonesia. Holding the Conference in Mexico highlighted the importance of reaching not only industrialized economies, and those in transition, but also developing economies. Moreover, it highlighted the central importance of environmental compliance and enforcement issues to both developing economies and the free trade movement.

Concerns about pollution havens, economic pressure to reduce environmental protection, and the potential erosion of environmental quality in countries where institutions to address environmental issues had not been developed were central not only to discussions of the recent North American Free Trade Agreement (NAFTA) but also of certain European Union problems. Clear signals were being sent that countries that wish to engage in free trade must meet a minimum level of competency in regard to environmental standards and the ensurance of compliance.

Governmental and non-governmental officials from 68 countries and international organizations attended the Third Conference, almost double the representation at Budapest. Some of the sharp lines dividing green and brown issues were blurred, and participants recognized the need of a common framework for learning from each other, whether the issues of concern involved tourism, forest management, or industrial and municipal pollution.

The Fourth International Conference

Sponsors of the Fourth International Conference on Environmental Compliance and Enforcement at Chiang Mai, Thailand, in April include not only VROM and US EPA, but also UNEP, Thailand's Pollution Control Department, Environment Canada, the European Commission, and the Environmental Law Institute. The Executive Planning Committee is co-chaired by its anchors, VROM (Pieter Verkerk, Inspector General) and

US EPA (Steve Herman, Assistant Administrator for Enforcement and Compliance Assurance). It includes UNEP Industry and Environment (Jacqueline Aloisi de Larderel, Director), UNEP's Environmental Law Center, the United Nations Development Programme, the WWF, Canada, Mexico, Chile, Poland, Hungary, the United Kingdom, Nigeria, Egypt, South Africa, Thailand, Malaysia, the Philippines and China.

There will be papers from more than 55 countries and international organizations. To enrich the basis for exchange, the Conference's Executive Planning Committee has commissioned several capacity-building support documents which build upon areas identified in UNEP training workshops, as well as other topics of interest at the previous International Conferences (**Boxes 2 and 3**).

The capacity-building support document on programme organization compares 19 country programmes and how they address issues such as degree of centralization, position in the hierarchy, degree of consolidation of functions, and single- or multi-media organization. The support document on financing and budgeting provides information on over 60 country programmes, along with key budgeting and financing concepts. The comparison of requirements for source compliance self-monitoring, reporting and record-keeping illustrates how different countries leverage scarce inspection resources and ensure that the regulated community has sufficient information to achieve compliance through self-monitoring and reporting while considering technical feasibility, cost to medium-sized and small businesses, and management of information. The international comparison of multi-media inspection protocols should help countries continue to explore the relative advantages and disadvantages of single- and multi-media approaches. In addition, given the importance of spreading the word about enforcement and gaining the support of an educated and supportive citizenry to make each enforcement action count, documents are available on communications and enforcement.

It is important not only to have these tangible products, but also to develop regional mechanisms for continued exchange – leading to appropriate mechanisms for international cooperation and shared progress. The European Enforcement Network of the European Commission and Member States (IMPEL, which stands for Implementation and Enforcement of Environmental Law) was largely inspired by exchanges at the First International Enforcement Workshop. Following the Second International Conference in Budapest in 1992, the Regional Environmental Centre for Central and Eastern Europe helped foster further exchanges among governmental and non-governmental officials in Central and Eastern Europe. During informal sessions at the Third International Conference, participants from the Americas spontaneously developed the Oaxaca Declaration, committing themselves to work together to establish a network to help build programmes. Subsequently, the Summit of the Americas led to more formalized efforts. And in November 1994 UNEP and the National Environmental Protection Agency of the People's Republic of China organized an Asian regional workshop on industrial compliance attended by representatives from eight countries.

Box 3
International Workshops and related technical and capacity-building support documents

Principles of Environmental Enforcement International Training Course and Stand-alone Technical Support Documents

- Principles of Environmental Enforcement text
- Coal burning, iron and steel (first case/no support document)
- Petroleum refining and petrochemicals
- Metallic ore and minerals mining
- Residential and industrial (solid) waste disposal
- Deforestation
- Tourism
- Transboundary illegal shipments of hazardous waste, pesticides and contraband CFC (under development)

UNEP Industry Environmental Compliance: A Training Manual

- Organizing permitting, compliance monitoring and enforcement programmes
- Financing and budgeting resources for compliance and enforcement programmes
- Enforceable permitting processes
- Compliance mmonitoring and enforcement

Capacity-building Support Documents

- Organizing permitting, compliance monitoring and enforcement programmes
- Financing and budgeting resources for compliance and enforcement programmes
- Comparative study of source compliance self-monitoring requirements
- Comparative study of multi-media inspection protocols

Communications and Enforcement Workshop

- Communications and enforcement

Conclusion

The Fourth International Conference will provide an opportunity for participants to consider the most appropriate approaches for their own countries and regions. Reports on regional meetings of officials from Africa, the Americas, South Asia, Southeast Asia and the Pacific, Central and Eastern Europe, West Asia and the Middle East, and Western Europe will summarize shared problems and challenges, institution-building needs, opportunities for support and exchange, and proposals for regional and international networking and cooperation.

References

1. US EPA (1992) *Principles of Environmental Enforcement.*
2. UNEP IE (1992) *From Regulations to Industry Compliance: Building Institutional Capabilities.* Technical Report No 11.

Copies of Conference proceedings and related technical and capacity-building support documents can be obtained by contacting either:
Ms Cheryl Wasserman, Associate Director for Policy Analysis, Office of Federal Activities, Office of Enforcement and Compliance Assurance, US EPA, Mail Code 2251-A, Washington, DC 20460, USA. Tel: +1 (202) 564 7129, Fax: +1 (202) 564 0070 or:
Mr Jo Gerardu, Inspector, Inspectorate for the Environment/PC 681, Ministry of Housing, Spatial Planning and the Environment, P.O. Box 30945, 2500 GX Den Haag, The Netherlands. Tel: +31 (70) 339 2536, Fax: +31 (70) 339 1300.

Inquiries about the UNEP training workshops and materials can be directed either to:
UNEP IE, Tour Mirabeau, 39-43 quai André-Citroën, 75739 Paris Cedex 15, France. Tel. +33 (1) 44 37 14 50; Fax: +33 (1) 44 37 14 74; E-mail: unepie@unep.fr or:
Mr Rob Glaser, Inspector, International Affairs, HIMH/VROM, Ministry of Housing, Spatial Planning and the Environment, Seissingel 4, P.O. Box 394, 4330 AJ Middleburg, The Netherlands. Tel: +31 (11) 803 3792, Fax: +31 (11) 802 4126. ◆

A multi-media, integrated approach to environmental compliance and enforcement

Sarah C. Stiles, UNEP IE research intern, Northeastern University School of Law, Boston, Massachusetts, USA

Abstract

Multi-media compliance considers releases to all environmental media in an integrated manner. A comprehensive environmental license or permit for a facility addresses all media (and cross-media effects), as do compliance inspections and enforcement responses. Examples are given of the incorporation of this integrated approach in environmental policies in France, the United Kingdom, the Netherlands, the United States and the European Union.

Résumé

La conformité multimédia tient compte des émissions de polluants en intégrant tous les milieux qui composent l'environnement. Une licence ou une autorisation globale accordée à une usine concerne tous les milieux (et les effets croisés entre différents milieux), tout comme les inspections de conformité et les mesures coercitives. L'article présente des exemples d'application de cette approche intégrée dans les politiques environnementales en France, au Royaume-Uni, aux Pays-Bas, aux Etats-Unis et dans l'Union Européenne.

Resumen

El cumplimiento multimedio ambiental toma en cuenta las emisiones a todos los medios ambientales de una forma integral. Una licencia o permiso ambiental extenso para una instalación consigna todos los medios (y los efectos que van más allá del medio) del mismo modo que las inspecciones de cumplimiento y las respuestas de ejecución. Se dan ejemplos de la incorporación de este enfoque integral en las políticas ambientales en Francia, Reino Unido, Países Bajos, Estados Unidos y la Unión Europea.

This article was prepared during an internship at UNEP IE.

Since the days of the first "Earth Summit" in Stockholm in 1970, far-reaching environmental legislation has been enacted to protect the earth. By trial and error, with rigorous debate on the merits of command-and-control vs. market incentives, and through the efforts of environmentalists of all stripes, legal systems across the globe have adapted legislation and crafted policy initiatives to conform with the realities of the biological environment. Legislation and policy are only as good as the resulting compliance, however, and many good environmental laws and rules have encountered widespread non-compliance and weak enforcement.

Policy-makers have recognized enforcement as a problem and have begun to pursue new strategies to improve the compliance rate. Along with new approaches, there is a new lexicon, including the term "multi-media compliance". Multi-media in the environmental context is considerably different than in popular parlance. Environmental policymakers have used the term to refer to air, water, soil and waste. Although it would appear reasonable to consider various media simultaneously, this has rarely occurred. Environmental policy history is replete with political battles, budget wrangling, ideological intrigue, and complex relationships with the business sector. As a result, even environmentally friendly managers in industry have been frustrated to find that, for example, by meeting air pollution emission standards they have subsequently violated standards for water, soil or air.

Multi-media compliance represents a more holistic approach to achieving a clean environment. This approach examines the "big picture," – emissions, the geographic location, wind patterns, social impact – in order to come up with a plan that will be both effective and practically realizable. Releases to all environmental media (e.g. air emissions, wastewater discharges, and solid and hazardous wastes) are considered simultaneously and in an integrated manner. This means that the environmental permit or license for a facility addresses *all* environmental media, as do compliance inspections and enforcement responses.

The advantages of a multi-media approach include:

- It allows practical consideration of cross-media effects, e.g. the effects of air or water pollution treatment on solid waste generation;
- It encourages consideration of upstream cleaner production approaches that could affect releases to multiple media, such as making processes more efficient or changing toxic materials use;
- It allows the facility operator to consider a full range of environmental improvements;
- It avoids investments in single-medium solutions that may have adverse effects on other media and that might require future retrofitting, thereby helping find the optimum solution from both an environmental and economic point of view.

Forward-thinking decision-makers in several countries have incorporated this new focus into legislation and policy with positive results. Following are highlights of what some countries are doing to integrate a multi-media compliance focus into their national legislation.

France

The French trace France's integrated system of pollution control back to the Napoleonic era and the Imperial Decree of 1810. Modern-day French environmental legislation is a direct descendant of this Decree, which was overhauled by the "Law of 19 December 1917," followed by the first major water law in 1964. The most comprehensive environmental legislation directed primarily towards the industrial sector was passed in 1976 (*Loi no. 76-663 du 19 juillet 1976, relative aux installations classées pour la protection de l'environnement*). This major piece of legislation was updated in 1985, 1992 and 1993.

Environmental permitting on the regional level in France is handled by DRIRE (*Direction regionale de l'industrie, de la recherche et de l'environnement*). There is a DRIRE for each region. Work has been done recently to revise the environmental permits that inspectors use, known as *arrêtés cadres*. The revision is intended to avoid contradictory requirements, and prescriptions that are technically unreasonable for the facility to implement.

The typical *arrêté cadre* has four parts. First, there is a definition of the type of facility that requested the permit. Precise definitions are favoured, to avoid any disputes or misunderstandings. The second part describes general requirements, including those covering potential mishaps, along with objectives that are considered indispensable in order to protect the environment. Third, there is a list of prescriptions that complement the general rules. These are targeted to the specific facility. The fourth part outlines punitive measures in the event of failure to implement the above regulations.

A general *arrêté cadre* can be over 50 pages long, with an extensive second section addressing environmental standards for the facility. Subsections include requirements regarding:

- noise and vibrations, with specified decibel levels and hours;
- air pollution, with clauses concerning accidents, chimneys, emission controls, etc.;
- water pollution, with clauses addressing different types of effluents, collection and conditions of liquid waste, release points, effluent treatment, cooling water, accident prevention, etc.;
- waste disposal in general, including waste management, collection and recycling, storage, transport, elimination, etc.;
- security – enclosure, guards, traffic;
- building design;
- emergency measures; and
- training of personnel.

The comprehensive nature of the *arrêté cadre* illustrates the integrated French approach to environmental permitting. It is truly multi-media in scope and anticipates crossover effects among the environmental media. Each facility has one comprehensive permit. This avoids the problems of government agency duplication and reduces frustration among industrial managers, who are not required to fill out several lengthy applications. According to French environmental officials, this system, while not perfect, has worked well.

The United Kingdom

The UK has made the multi-media approach the focus of Integrated Pollution Control (IPC), which is a fundamental part of the Environmental Protection Act of 1990. The processes to be controlled, as well as the necessary timetables, are detailed in the Environmental Protection (Prescribed Processes and Substances) Regulations of 1991. These regulations require that all industrial processes be approved by Her Majesty's Inspectorate of Pollution (HMIP), which determines approval on the basis of an "integrated" environmental assessment procedure. The guidelines are detailed in the Chief Inspector's Guidance Notes, which are as closely tailored to the unique features of the facility as possible.

When there is a risk of more than one medium being polluted, the Act requires that the Best Practicable Environmental Option (BPEO) be implemented. Industry is obliged to use the Best Available Technology Not Entailing Excessive Cost (BATNEEC) to ensure the least destructive impact on the environment from its processes. Gradually, both government and industry are becoming more comfortable with the application of these terms in practice. IPC has brought to light considerable information gaps in government and industry, neither of which was able to answer some basic questions regarding the assessment of industrial impact on the local environment and eco-systems or ambient pollution levels. In response to this lack of knowledge on which to base effective policy, officials in HMIP have been working to establish clear levels of "tolerability" that can be practically followed by inspectors in the environmental assessment procedure.

Table 1
The Minnesota multi-media inspection initiatives: advantages and problems

	Advantages	Problems
"Busload" approach	Inspectors can identify environmental problems not ordinarily found in traditional inspections.	The process can be time-consuming and result in inefficient use of staff time, especially if close coordination is lacking.
	The single inspection approach is well-received by larger companies, who see the process as less disruptive and more helpful than serial inspections.	A large number of inspectors can overwhelm small companies.
	Multi-media inspections increase opportunities for compliance assistance, and result in less conflicting advice.	Differences in enforcement philosophies among media divisions may be highlighted.
"Checklist" approach	This approach seemed to be effective in pointing out general compliance or technical assistance issues that could be referred to staff for detailed follow-up.	Inspectors could not do in-depth review for problems outside their area of expertise after the small amount of training they were provided.
	This approach was more efficient than the busload approach.	Inspectors occasionally asked ill-informed questions.

The Netherlands

The Netherlands is another country that has made a public commitment to the multi-media approach. In May 1995 the government published *Environmental Law Enforcement in Practice in the Netherlands, an Integral Approach.* This document detailed the Netherlands' unique environmental problems and described the more holistic multi-media strategies that have been incorporated at all levels of policy implementation.

Like many other industrialized countries, the Netherlands had ambitious, well-intentioned environmental legislation and permitting procedures in place by the 1970s, but the compliance rate was by all accounts dismal. Policy-makers recognized that the problem lay in the fragmented character of the country's environmental policy, which reflected the common reactive response to environmental problems ("putting out fires"). The Environmental Protection (General Provision) Act of 1979 was an initial attempt to begin the task of harmonizing Dutch environmental policy and permitting procedures. Intense discussion in the early 1980s finally bore fruit with two additions to the Act: environmental impact assessment (1986) and financial provisions and performance bonds (1990).

Despite the best intentions of policymakers, however, there was still a need to simplify licensing procedures to maximize compliance across the board. The Environmental Management Act (1993) was passed in response to this need. This Act integrated the existing relevant legislation regarding air, waste and nuisances. The Pollution of Surface Waters Act was not incorporated into the general act, but it was stipulated that there would be coordination with licensing procedures concerning water included in the Waters Act. The Environmental Management Act's multi-media character is shown by its requirement of comprehensive environmental licensing procedures.

Most environmental implementation in the Netherlands is controlled at the provincial level. The Provincial Executive supervises compliance and enforcement, and employs inspectors and administrators who grant licenses. Inspectors are trained to verify compliance with the various media regulations. Industry management is required to submit reports that must be determined to comply with their licenses.

The European Union

The EU is actively pursuing multi-media strategies to achieve environmental compliance. A Directive to require Integrated Pollution Prevention and Control (IPPC) is currently before the Member States. The amended proposal for the Directive, still in discussion in Council, is expected to be approved in spring 1996.

The two fundamental principles of IPPC are: that industrial releases be subject to "Best Available Technology" (BAT), and that all permits "achieve a high level of protection for the environment as a whole". The IPPC Directive defines "available" as techniques that have been "developed on a scale which allows implementation in the relevant industrial sector...as long as they are reasonably accessible to the operator." In addition, BAT must have "practical suitability".

While Member States are obliged to use the "best available technology," no specific technology is required. Rather, it is important that geographic location and the unique local characteristics of the environment be taken into account. Member States are allowed to draw up specific requirements for facilities in their countries as long as they do not compromise the requirements of the Directive. Most important, however, they must guarantee an *integrated* approach resulting in an overall high level of environmental protection.

Environmental policy in the EU has evolved in many directions. Member States will be sharing information on the latest "best available technology", as well as their experiences with effective policy implementation and compliance. For example, The UK's experience grappling with the

definition of "accessible" technology will help countries starting from scratch in this area. All Member States must incorporate the Directive into their national legislation within three years of its publication in the *Official Journal of the European Communities*.

The United States

In the United States the most impressive innovations are taking place at the state level, with the expectation that they will "percolate up" into federal environmental policy. California and Minnesota are two of the states that have implemented new permitting strategies.

California

A state well-known for its progressive environmental policies, California has made headway in adopting a multi-media approach and fostering a cooperative relationship between government and business. "Sonoma Green Business" is a good example of how a programme can achieve positive results by establishing a multi-agency effort towards multi-media compliance. Preliminary research showed that despite serious violations resulting in hazardous waste in the Sonoma sewer system, businesses had actually been struggling to comply with the regulations. Business owners expressed frustration with the permitting and inspection system, saying that the regulations were confusing and contradictory. This supports the notion that most companies would rather not pollute if they are shown how to avoid it, and if they do not suffer market disadvantages.

The plan was to design an incentive programme that would break down the adversarial relationships among agency inspectors, business owners, and different agencies. To create a truly multi-agency effort, all agencies were included. Agencies with any jurisdiction over any medium cooperated in drafting a permit that encompassed all relevant issues. The incentive element came after the inspection. Businesses that achieved a perfect compliance record were given decals to display.

The results in Sonoma are promising. Compliance with regulations improved across all media. Relations between businesses and regulators improved, businesses enjoyed a competitive advantage by keeping "clean", and the public had an active part in voicing its preference for clean business in the community.

Minnesota

In Minnesota businesses, shared frustration about the disjointed nature of environmental policy and enforcement. Minnesota legislation does not specifically require integrated multi-media permitting. However, the Environmental Coordination Procedures Act allows an industry whose project would require multiple environmental permits to submit a single master application for all permits. Most inspections are conducted by the Minnesota Pollution Control Agency.

The Pollution Control Agency has carried out two multi-media inspection initiatives in the past few years. One, called the "Lake Superior Initiative," used the "busload" approach. Between four and ten inspectors (at least one representing each medium) participated in the inspection, led by a coordinator who organized the inspection process.

The second initiative, the "Minnesota River Initiative", utilized a multi-media enforcement "checklist". Thirty inspectors were provided with approximately five hours of training in the use of this checklist. From one to three inspectors then used it to review each facility.

Each of these initiatives had some problems as well as advantages (**Table 1**). For example, the size of the company is very important in determining which inspection method is appropriate to employ. The "busload" approach may be suitable to larger companies, while the "checklist" approach may be better for smaller ones. When the "checklist" approach is used, inspectors need more intensive training in order to do a thorough job.

Inspections that used the multi-media approach increased management understanding of environmental problems in general and cross-media transfers in particular. Communication between management and regulatory agencies also improved. Better awareness of the multi-media impact of pollution is a good starting point for pollution prevention technical assistance.

Conclusion

As society grasps the meaning of the long-term effects of all kinds of pollution and suffers its multiple impacts, policy-makers are struggling to find the most effective ways to manage the environment. It has become clear that the traditional, isolated approach of "putting out fires" is not only inefficient, but counterproductive. The legislation of the future will reflect the interdependence that is increasingly common in many sectors of society. UNEP IE can help support the evolution of more holistic approaches to environmental compliance by serving as a clearinghouse for innovative ideas that can be used by governments and industry.

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Policies and programmes to encourage industry compliance: the Philippine experience

Rachel A. Vasquez, Environmental Management Bureau, Department of Environment and Natural Resources, Tejaz Building, 99-101 Kamias Road, Quezon City 1102, The Philippines

Abstract

This article surveys policies and programmes in place in the Philippines to encourage industry compliance with environmental protection measures. The concept of environmental protection is presented in one basic law, known as the "Philippines Environment Policy". There are systems for monitoring and enforcement. The Department of Environment and Natural Resources (DENR) has initiated several programmes and projects aimed at developing innovative approaches to pollution reduction and waste management.

Résumé

Cet article passe en revue les politiques et les programmes mis en oeuvre aux Philippines pour encourager le respect des mesures de protection de l'environnement par les industries. Le concept de protection de l'environnement est défini dans une loi-cadre, connue sous le nom de « Politique Environnementale des Philippines ». Des moyens permettant de contrôler le respect de la réglementation sont prévus. Le Ministère de l'Environnement et des Ressources Naturelles (DERN) a lancé plusieurs programmes et projets destinés à développer les approches innovantes du problème de la réduction de la pollution et de la gestion des déchets.

Resumen

Este artículo realiza una encuesta sobre las políticas y los programas adoptados en las Filipinas para alentar el cumplimiento de las medidas de protección medioambiental por parte de la industria. El concepto de protección ambiental se presenta en una ley básica, conocida como la "Política Medioambiental de las Filipinas". También existen sistemas de supervisión y ejecución. El departamento del Medio Ambiente y de los Recursos Naturales (DENR) ha iniciado varios programas y proyectos que tienen como objetivo crear enfoques innovadores para reducir la contaminación y la gestión de los desechos.

Introduction

The Philippines' major cities, including the Metropolitan Manila Area (MMA), have become overcrowded and are beset with critical problems of pollution, garbage, flooding, slums and traffic congestion resulting in a deteriorating urban environment. Development has taken place in a largely random and unplanned manner, due to lack of a responsive land use/zoning ordinance to direct and control growth. The incidence of environment-related health problems has also become increasingly common. Metro Manila's urbanization started in the early 1940s, when Manila was the only major city in the Philippines. But by 1970, with the issuance of Executive Order No. 392, the cities of Manila, Quezon, Pasay and Caloocan and the adjacent municipalities of Rizal and Bulacan constituted the Metropolitan Manila and Development Authority (MMDA). Four municipalities (Mandaluyong, Pasig, Makati and Muntinlupa) also became cities in 1995. The MMDA has a total land area of 636 square kilometres, approximately 0.2 per cent of the total area of the Philippines. Its estimated population of eight million people represents 12 per cent of the country's total population. The population density is about 12,600 people per square kilometre. The population doubled during the period 1970-1990.

The major urban water bodies in the MMDA are the Pasig-Marikina River System, the Navotas-Malabon Tullahan-Tenejeros (NMTT) River System, Manila Bay, and Laguna Lake. The NMTT River System is considered the most heavily polluted, due to industrial and domestic discharges. Its BOD level can go as high as 500 mg/L which is 50 times above the allowable standard.

Laguna Lake's water quality is acceptable for growth and propagation of aquatic life and industrial uses. Toxic and hazardous pollution levels at present do not threaten public health, but continued uncontrolled discharge may produce serious health threats in the near future. The coastal waters of Manila Bay, the catchment area of two river systems, are considerably polluted. Bottom water shows DO levels below the Environmental Management Bureau (EMB) limits and total coliform counts as high as 512,000 MPN/100 ml, which also exceeds the Philippine standard limit of 5000 MPN/100 ml for Class SC waters. Groundwater has been affected by overextraction, resulting in a lowering of the aquifer level and saltwater intrusion in coastal areas. Generally, there are three main categories of water pollution sources in the MMA: domestic wastewater, domestic solids and industrial wastewater. In terms of BOD, the estimated pollution loads generated are as follows: domestic wastewater, 318 tonnes/day; domestic solids, 177 tonnes/day; and industrial wastewater, 303 tonnes/day.

Generally, the sources of air pollution may be classified into fixed (or stationary) and mobile sources:

a. *Fixed sources* – Energy-generating facilities such as thermal power plants are the main source of industrial air pollution. Factories involved in the manufacture of steel products, chemicals, cement, etc. are another source.

b. *Mobile sources* – Population growth in Metro Manila has been accompanied by significant increases in the number of vehicles. Most are private passenger vehicles, taxis or motorcycles. Out of around a million vehicles registered in 1995, approximately 25 per cent are diesel-fueled. Diesel-powered jeepneys, buses and taxis, which provide public transportation, cause serious particulate and "black smoke" problems on all the city's major streets.

Studies by the Philippine Department of Environment and Natural Resources (DENR) indicate that the public is exposed to extremely high concentrations of particulate matter and, to some extent, lead concentrations. While industrial emissions and other sources of air pollution must also be regulated to prevent further degradation of air quality in Metro Manila, a World Health Organization (WHO) report identified control of motor vehicle emissions, particularly diesel smoke, as the most crucial environmental problem facing the Government of the Philippines at present.

Philippine industry

Solid waste management, related to the shortage of acceptable dwellings for squatters, has likewise become a major urban problem. Studies show that MM generates about 6000 metric tonnes of garbage daily. Only about 85 per cent of these wastes is collected, with the remaining 15 per cent left on the streets or in storm drains, *esteros* and waterways, contributing to flooding problems during

the rainy season. Much of MM is prone to flooding. About 4000 hectares, or 7 per cent of its total area, is flooded annually. Twenty-three per cent of the population is directly affected by the flooding problem. Due to the absence of disposal facilities for toxic and hazardous wastes, those in the sanitary landfills are dumped together with domestic wastes.

The distribution of heavy industry is mainly characterized by concentrations of factories in areas taking advantage of waterfront locations for transportation. However, industry is also concentrated along the main transport arteries.

There is no efficient, extensive sanitary sewage system. Neither is there an adequate centralized sewage treatment plant. In fact, only about 15 per cent of Metro Manila's population is served by a sewage collection system. As a result, large quantities of domestic sewage with high organic loading are continually discharged into its bodies of water. These wastes, generated by the public in general, already account for 62 per cent of all the biodegradable organic pollutants that flow into the different service systems. In addition, untreated or partially treated industrial wastewater is being discharged directly into rivers, lakes and bays, or into *esteros* and canals that eventually lead to them. These wastes account for the other 38 per cent of pollutants discharged into Metro Manila's water systems. Among the industries identified as the largest contributors of water pollution (BOD load) are food processing, piggeries, beverages, and dyes and textiles.

There are about 11,000 manufacturing firms in the country. About 50 per cent of industries are located in Metro Manila. The main manufacturing industries are textiles, pulp and paper, sugar, alcohol and distilleries, desiccated coconut, food manufacturing, plastics and consumer goods. They cause the most pressing pollution and solid waste problems. The major urban centres, other than the National Capital Region (NCR), are also beset with slum proliferation. Their pollution and solid waste problems arise from inadequate infrastructural systems unable to cope with rapidly growing populations.

Industrial estate development is currently taking place in areas adjacent to Metro Manila, especially to the south (Calabarzon).

Environmental policies and regulations

The concept of environmental protection is premised under one basic law, Presidential Decree (PD) No. 1151, known as the Philippine Environment Policy. It declared a continuing policy of the state (a) to create, develop, maintain and improve conditions under which man and nature can thrive in productive and enjoyable harmony with each other; (b) to fulfill the social, economic and other requirements of present and future generations of Filipinos; and (c) to ensure the attainment of an environmental quality conducive to a life of dignity and well-being.

Industrial establishments are governed by a variety of laws that have been created over the past two decades. The laws with the most direct impact on industrial pollution are Presidential Decree 984 (PD 984), establishing standards for air quality, water quality and noise; Presidential Decree 1586 (PD 1586), requiring the preparation of an Environmental Impact Assessment for development projects; and Republic Act 6969 (RA 6969), commonly known as the Toxic Chemicals and Hazardous Wastes Control Law.

The major legislation governing pollution control is Republic Act (RA) No. 3931, as amended by Presidential Decree (PD) 984, which created the National Pollution Control Commission (NPCC). This law declared it a national policy to maintain reasonable standards for the waters and air for domestic, agricultural, industrial, and other uses. This mandate provided for the establishment of reasonable standards for air, water and noise. PD 984 was then amended by Executive Order No. 192, creating the Environmental Management Bureau and placing this Bureau under the DENR. The Pollution Adjudication Board, which assumed powers and functions of the NPCC with respect to the adjudication of pollution cases, was likewise created under the Office of the DENR Secretary.

The Implementing Rules and Regulations of the above laws likewise underwent a series of amendments. The latest pollution standards are contained in DENR Administrative Order Nos. 14, 14-A, 34 and 35 for air and water quality standards, respectively.

PD 1586 established the Environmental Impact Statement (EIS) system and requires all agencies and instrumentalities of the national government, including government-owned or controlled corporations as well as private corporations, firms and entities, to prepare, file and include in every action, project or undertaking which significantly affects the quality of the environment the baseline characterization of the location of the project. They should also assess and predict environmental impacts, and recommend mitigating measures to address the negative environmental impacts.

In short, the proponent of any project which is a potential source of environmental pollution/degradation is required to secure an Environmental Compliance Certificate (ECC) from the DENR/EMB by submitting an EIS.

The enactment of another environmental law, RA 6969 (Toxic Substances, Hazardous and Nuclear Waste Control Act of 1990), further mandated the DENR to regulate hazardous and nuclear wastes as well as toxic substances in the Philippines.

RA 6969 declared it a policy of the state to regulate, restrict or prohibit the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment; to prohibit the entry, even in transit, of hazardous and nuclear waste into Philippine territorial limits for whatever purpose; and to provide research and studies on toxic chemicals and hazardous and nuclear wastes.

Permitting and licensing system

Permitting is the most fundamental regulatory element within any command-and-control system. It controls the discharges from pollution sources. In the Philippines, it is routine to include the permitted discharge limits in the Environmental Compliance Certificate (ECC) that is pursuant to the EIA process.

Permit management functions ordinarily include the establishment of discharge limits pursuant to a standard, and monitoring of the permit holder's compliance therewith. These functions are presently performed by DENR regional offices for those industries that fall outside the EIS prescriptive list of ECPs and (theoretically) for those industries that existed prior to the EIS system (before 1982).

The regulatory power exercised by the DENR Regional Offices, particularly the Environmental Management and Protected Areas Sector (EMPAS), consists in the ability to issue permits as stated in 2nd paragraph, Sec. 8, PD 984, to wit:

"No person shall perform any of the following activities without first securing a permit from the Commission for the discharge of all industrial wastes and other wastes which could cause pollution: (1) the construction, installation, modification or operation of any sewerage works or any extension or addition thereto; (2) increase in volume or strength of any wastes in excess of the permissive discharge specified under any existing permit; and (3) the construction, installation or operation of any industrial or commercial establishments or any extension or modification thereof or addition thereto, the operation of which would cause an increase in the discharge of wastes directly into the water, air and/or land resources of the Philippines or would otherwise alter their physical, chemical or biological properties in any manner not already lawfully authorized."

In practice, the Regional Offices issue two kinds of permits. One is the Authority to Construct (A/C), which is issued once before the construction of the anti-pollution device and again after the plans and specifications are approved. The other is the Permit to Operate (P/O), which is issued annually to authorize the continued use of the air and water pollution control device and air pollution source. Water pollution sources are not subject to annual re-issuance of the P/O. The annual permit review and reissuance of the P/O is not mandated by PD 984; thus, permit life is a matter of internal guidance by DENR.

There are three requirements for the issuance of the Permit to Operate (P/O):

1. prior issuance of the Authority to Construct (A/C);
2. inspection which shows that the conditions imposed in the A/C are complied with (i.e. the anti-pollution device is properly maintained and still sufficient); and
3. the anti-pollution device's having passed the test for efficiency.

Should any of the requirements be absent, a temporary permit, which is effective only for six months, may be issued. Usually the failure to complete the requirement is due to the inability of the Regional Office to conduct the necessary inspection or test because of lack of transportation, budget for travel, testing equipment, a laboratory, or

trained personnel.

This power to issue permits is generally perceived by the field officers to be a useful regulatory tool. Some of their observations/recommendations on the existing permitting requirements are:

1. "The requirement for annual renewal ensures that we don't lose contact with the industrial establishment even when we lack the necessary logistics to conduct regular inspections. They come to us with the information we require. This is especially useful in monitoring the activities of small and medium-scale industries, which we usually see only once a year during the period for renewals of the P/O. At present we have issued more temporary permits, with six months affectivity, than regular permits. The constraint is on our part, on our inability to conduct timely inspection and testing."

2. "We should study whether we need to require renewal of Permit to Operate (P/O) on a yearly basis. This function makes our office mainly an industry-regulating office when our resources should be devoted rather to initiating, supporting, and implementing environmental protection programmes. It is also consuming too much of the industry's time and effort when the burden of monitoring should be on us. It is better to simply require the industry to install a self-monitoring device and to regularly submit reports together with the result of the indicators in their analyser or monitoring equipment. The Regional Office can then just perform spot-checking instead of inspecting all the industrial plants in the region yearly."

3. "The Regional Office devotes most of its time to conducting routine inspections related to issuance of permits. Authority to Construct (A/C) is a meaningful regulatory mechanism because we can already put in place, at the construction phase, the company's pollution control scheme. DENR gets the chance to examine the plans and specifications for the anti-pollution device to determine its sufficiency and appropriateness.

4. "One weakness in our permitting regulation is the lack of power of the Regional Office to stop the industry from constructing and operating the anti-pollution device or undertaking activities that cause pollution. We should have this power. Right now, we can only impose a 'compromise penalty' of P1,000.00 pursuant to an NPCC Memorandum, Series of 1986 in case of failure to secure Authority to Construct (A/C)."

A perusal of PD 984 will readily show that the present practice does not satisfy the mandate of the law. The permitting regulation practice at present is confined to the proper construction and maintenance of the pollution control device. In contrast, the law authorizes the licensing of increases in volume or strength of any wastes discharged and the construction, installation or operation of any industrial or commercial establishments which would cause an increase in the discharge of wastes. This means permitting regulations should cover the volume and concentration of discharges (the implication being some limitation on cumulative effects) and the construction/installation of all pollution sources, not just those affecting air. Thus, in this instance, regulatory practice needs to catch up to the breadth of the statutory mandate. In addition, further thought should be given to increasing permit life to, say, five years and then concentrating on compliance monitoring with regular reports on emissions sent to the Regions by industry.

Monitoring and enforcement

Monitoring is the linchpin of a command-and-control regulatory programme. If there is no monitoring, or if it is ineffectively done, there can be no meaningful programme. For the regulator, monitoring the performance of an industrial permit holder takes several forms. It includes inspections, sampling, and effluent analysis and assessment. Monitoring should take place on a regular as well as an unscheduled basis. Compliance monitoring is a prelude to enforcement and provides the proof required for the imposition of sanctions.

Discharge of effluent into the receiving body of water is the activity regulated by law. The standards are based on the level of concentration of the different parameters of pollutants in the water. As to quantity, the maximum volume of discharge may be set on a case-to-case basis when required for the protection of public health and the aquatic resources of the country.

With the devolution of the implementation of PD 1181 on vehicular emissions to the Local Government Units (LGUs), monitoring of compliance with air quality standards is done primarily by the Land Transportation Office, the LGUs, the Philippine National Police and the DENR. For any violations of the rules, the imposable penalty is a fine not exceeding 200 pesos (P200.00) for the first offense, P500.00 or less for the second offense, P1000.00 or less for the third and succeeding offenses, plus the suspension of the vehicle's certificate of registration until compliance occurs. These regulations have never been effectively enforced at any time in the country's history. There is no sufficient testing equipment or efficient enforcement machinery, including personnel, to do so.

Monitoring of the EIA system is done by EMB for Environmentally Critical Projects and by the DENR Regional Offices for projects within Environmentally Critical Areas. Violations of PD 1586 or any of the conditionalities in the ECC carry the sanction of "suspension or cancellation of ECC or a fine in an amount not to exceed P50,000.00 for each violation" (Section 9, PD 1586). Consideration should be given to increasing the P50,000.00 sanction in PD 1586, a 1978 law whose economic references have been eroded by inflation, and to encouraging industry to secure the ECC prior to any construction activity.

The monitoring/enforcing body which regulates emissions from stationary sources is the DENR Regional Office, through its permitting function. This includes regulation of potential sources and fuel quality, through issuance or non-issuance of A/C and P/O. PAB also regulates emissions through its quasi-judicial powers. The Philippine enforcement scheme, however, does not appear to link the control of emissions to a health-based ambient standard. PAB's main regulatory instruments are the issuance of the Cease and Desist Order (CDO) and the imposition of fines. Non-payment of fines carries the sanction of "closure", the only "closure" power of PAB under PD 984.

The Philippine Coast Guard was designated as the primary agency responsible for enforcement of laws pertaining to marine pollution. It was provided, however, that "it shall be the joint responsibility of the Philippine Coast Guard and the DENR to coordinate and cooperate with each other in the enforcement of the provisions of this decree and its implementing rules and regulations. The arrangement reached by DENR with the Philippine Coast Guard is for the Coast Guard to take care of marine pollution from sea-based sources and for DENR to regulate marine pollution from land-based sources.

The primary agency enforcing PD 984 is the DENR. PAB may impose CDOs and fines or may institute criminal prosecution for the application of penal sanctions provided under PD 984. A permit that regulates the technology itself and its pollution control capability is missing. Industrialized countries often refer to this as Best Available Control Technology (BACT). Moreover, load or rate of discharge, in addition to concentration, should be routinely factored into water discharge permits in order to defeat cheating through dilution. Finally, discharge permits should be specifically linked to ambient standards in all receiving waters so that the ambient health-based standards will not be exceeded. Until these matters are addressed, the Philippine water programme will not be effective.

Industry's role is to ensure that the promise it makes in its permit is kept. Ideally, continuous emission monitoring of air and water discharges, with record-keeping and regular reporting of monitoring results to the regulator, enhances the integrity of any monitoring programme. Such conditions are expected within the next two to three years. Pollution Management Appraisals (PMA) recommendations should be monitored to determine implementation, to obviate usage of DAO 17 as a shield. DAO 17 provides that companies voluntarily participating in the conduct of Pollution Management Appraisals are given a moratorium on the issuance of a Cease and Desist Order for one year. DENR should guide the industrial manager on monitoring protocols, record-keeping and reporting.

Additionally, an upcoming role for DENR regional monitoring units is found in DENR's increasing responsibilities in the area of pollution prevention. DENR regional personnel will have to add skills in clean technologies, process changes, and materials substitution in order to monitor and assess, for example, environmental benefits to be gained from PMAs. This and still other forms of monitoring should be expected in the future. In short, monitoring assures compliance and grounds enforcement.

The Multipartite Monitoring Team concept, created in DAO 21, represents an attempt to spread the responsibility for monitoring and, at the same time, involve the local community so as to

assuage its concerns. This is a fairly new mechanism and needs time to stabilize. Its principal problem is a lack of technical expertise at all levels – the LGUs, the NGOs, the Regional Development Councils (RDCs), and even the DENR Regional Offices. Other problems include the lack of authority for non-government members to enter a facility; unclear status of EGF to fund monitoring; coordination with other authorities; sharing data with LGUs; DENR's lack of funds and staff; as between the ECC and PD 984, the monitoring purpose being unclear; lack of data; and DENR monitoring of sources only if other permits are required.

In summary, there is a lack of role definition and trained personnel, which may be corrected by crisper legal/regulatory directives, comprehensive guidelines, and additional resources.

Government initiatives/programmes

The protection and conservation of the country's environment and natural resources is primarily mandated to the Department of Environment and Natural Resources (DENR). Created under Executive Order No. 192 in June 1987, the DENR has the responsibility to "ensure the sustainable use, development, management and conservation of the country's forests, mineral lands, offshore areas and other natural resources, including the protection and enhancement of the quality of the environment." The Environmental Management Bureau (EMB) under the DENR is specifically tasked with protecting the resources of the country from environmental degradation through the development of effective programmes and strategies for environmental protection and management.

In carrying out these mandates, the DENR has identified its main visions and goals on pollution control. The main thrusts are in the following areas:

1. Effective urban planning, along with a comprehensive zoning plan including waste disposal systems. This is seen as a vital aspect of pollution abatement.
2. With regard to the air pollution problem, the need to develop a comprehensive programme to hasten the desulphurization of diesel fuel oil and the removal of lead from gasoline.
3. Water pollution, particularly for the urban centres, cannot be significantly halted without the expansion of sewerage systems.

The DENR's current programmes and projects attempt to develop innovative approaches in challenging the participation of industries in the government's effort to protect the environment, and at the same time elevate the Philippines to Newly Industrialized Country (NIC) status by the year 2000.

In the area of environmental regulations, there has been an erratic compliance trend with regard to the enforcement of pollution control laws by industries. With the creation of the Pollution Adjudication Board (PAB) in 1987, compliance with pollution control requirements has improved. The PAB's record in compelling industries to put up anti-pollution devices has been relatively successful.

On the Issuance of the Authority to Construct/Permit to Operate, the following recommendations are given:

1. The validity of the annual permit to operate should be revised to either three or five years.
2. Industry will be required to set up continuous monitoring equipment and submit results to the DENR regional offices at a specific frequency (say, quarterly or annually).
3. Monitoring activities should be delegated to the private sector or accredited non-governmental organizations.

With the change in validity of the P/O, the DENR regional offices will have enough time for the conduct of monitoring activities, thus reducing/minimizing the issuance of the temporary P/O. Although industry is allowed to undertake monitoring and reporting activities, and the private sector and NGOs may do so as well, this does not preclude the DENR's conducting spot check investigations to determine a company's compliance.

Apart from the strict enforcement of the EIA system and the PAB requirements, the following are more recent indicators of appropriate environmental management in the Philippines:

1. With regard to Solid Waste Management, the closure of Smoky Mountain and the construction and operation of San Mateo and Carmona Sanitary Landfills.
2. Control of hazardous waste in the country through the issuance of Interim Importation Clearance (IICs). From 1991 to this year, 648 IICs were issued, of which 390 for ozone-depleting substances. Through the enforcement of Republic Act No. 6969, dangerous chemicals are being tracked down for a cleaner and safer environment.
3. Intensification of efforts to monitor and minimize air pollution through the procurement of monitoring and testing equipment for industrial pollution. Periodic assessment of industrial firms focuses on identifying, evaluating, and recommending improvement in process efficiency and the reduction of quantities and/or toxicities of certain waste types, thereby leading to an effective waste minimization programme.
4. Rehabilitation of river systems, specifically the Pasig River System.

To address the high BOD level of the Pasig River, in 1988 the government embarked on a programme called the Pasig River Rehabilitation Programme (PRRP) to clean the river with cooperation from industries and nearby communities. Recent assessment of the programme indicated that while industries can be compelled to comply with environmental standards and considerably reduce their discharges to the river system, discharges generated by domestic sources are more difficult to address. Unless they are addressed, there will not be any significant improvement in water quality.

The DENR's current programmes and projects aim to develop innovative approaches to respond to economic and environmental aspects of pollution reduction and waste management. The Industrial Environmental Management Project (IEMP), for example, addresses these concerns through a three-part strategy, namely: prevent or reduce pollution at its sources; reclaim industrial wastes, provided that such reclamation is technically and financially feasible; and encourage cost-effective abatement technologies for types of pollution that can neither be avoided nor reclaimed.

The three major components of the IEMP are:

- Pollution Reduction Initiative, which assesses the manner of prevention and reduction of industrial pollutants in selected industries and establishes and provides support for the implementation of pollution reduction recommendations.

Under this component is the Pollution Management Appraisal (PMA), which is a periodic assessment of industrial firms that focuses on identifying, evaluating and recommending improvement in process efficiency and reduction of quantities and/or toxicities of certain waste types, thereby leading to an effective waste minimization programme.

- Capability-building enhances cross-cutting knowledge and skills in technical, policy and administrative aspects of industrial pollution control and management.
- Policy studies and public/private dialogue aim to rationalize policies on industrial pollution and to foster constructive communication and private sector/citizen participation in activities related to industrial pollution.

These policy studies and public/private dialogue are equally important components of the IEMP. The policy study component looked at a wide range of legal and regulatory control mechanisms and recommended improvement of these policies to support the current government perspective of a market-based incentive supporting the command-and-control mechanisms. In theory, market-based mechanisms are seen to be anchored on command-and-control standards.

The current thrust of the industry is to adhere to the principle of sustainable development. It is the crucial role of business and industry in the social and economic development of the country to adhere to the promotion of efficient production technologies and procedures in order to reduce negative impacts on resources and environment.

Innovations in approaches to environmental protection need to match the current environmental and economic challenges. Our gradual shift from the traditional system of cleaning up pollution at the "end-of-pipe" or the "top-of-the-smokestack", towards the new approach of reviewing product design, production process and environmental factors together ,will hopefully address these challenges.

Among the foremost regulatory reforms of environmental management that ought to be strengthened are:

1. building a new spirit of collaboration/cooperation among government, industry and environmentalists;
2. encouraging new interest to capture opportunities inherent in environmentally superior technologies;
3. promotion of voluntary and non-regulatory initiatives by both producers and consumers; and
4. use of economic incentives and market-based mechanisms such as pollution charges, and the elimination of inappropriate subsidies. ◆

Meeting the challenges of Integrated Pollution Control

D. Slater, Director, Pollution Prevention and Control Environment Agency, Room P3/041, 2 Marsham Street, London, SW1P 3EB, UK

Abstract
This article explores the concept of Integrated Pollution Control (IPC) and considers the challenges it poses to regulators. It examines ways in which these challenges have been met by Her Majesty's Inspectorate of Pollution during the five years since the introduction in the United Kingdom of legislation requiring that industries be regulated through IPC.

Résumé
Cet article explore le concept de contrôle intégré de la pollution et les défis qu'il lance aux organes de réglementation. Il explique les divers moyens que l'inspection britannique de la pollution a utilisés pour relever ces défis au cours des cinq dernières années, c'est-à-dire depuis l'introduction au Royaume Uni d'une législation exigeant que les industries soient soumises au contrôle intégré de la pollution.

Resumen
Este artículo explora el concepto de Control Integral de Contaminación (IPC), y considera los retos que plantea a las autoridades reguladoras. También examina las formas en que la Inspección de Contaminación de Su Majestad ha cumplido con dichos retos a lo largo de los cinco años desde el momento de la introducción en el Reino Unido de la legislación que obliga a las industrias a someterse a la regulación IPC.

Introduction

The Environmental Protection Act of 1990[1] introduced a new environmental enforcement system known as Integrated Pollution Control (IPC) in the United Kingdom. Revolutionary new procedures had to be introduced by the regulating authorities to transform an enforcement system based on single medium controls to a truly integrated environmental enforcement system.

The relevant authorities for IPC in the UK are Her Majesty's Inspectorate of Pollution (HMIP) in England and Wales, Her Majesty's Industrial Pollution Inspectorate and the River Purification Boards in Scotland, and the Alkali and Radiochemical Inspectorate in Northern Ireland. This article explores the IPC concept, and the associated concepts of BATNEEC (Best Available Technology Not Entailing Excessive Cost) and BPEO (Best Practicable Environmental Option) from the perspective of HMIP. It also considers the challenges presented by the new concepts, and how these are being met by the Pollution Inspectorate.

Integrated Pollution Control

Key features

Integrated Pollution Control incorporates three key features of the Government's policy for environmental protection:

- First, it ensures that substances which are unavoidably released to the environment are released to the medium to which they will cause least damage.
- Second, it embodies the precautionary principle: prevention is better than cure.
- Third, it provides for public scrutiny of the regulatory process.

IPC provides a mechanism and a legal basis for looking at the impact which a process *as a whole* has on the environment *as a whole*. Its application in the UK has required a shift of emphasis away from abatement techniques and end-of-pipe solutions to pollution problems. Instead, an examination of the whole process must be carried out to identify ways to minimize harmful releases at source.

Statutory basis

The statutory basis for IPC is provided in Part I of the Environmental Protection Act 1990 (the Act). The Act prescribes the most seriously polluting processes for IPC (see Annex) and requires that no prescribed process can be operated without a prior authorisation from HMIP.[2]

HMIP is required either to grant an authorization, subject to any conditions which the Act requires or empowers it to impose, or to refuse it. HMIP must refuse it unless it considers that the applicant will be able to carry on the process in compliance with the conditions in the authorization.

In setting the conditions, HMIP is required by the Act to ensure that:

- the best available techniques (both technology and operating practices) not entailing excessive cost (BATNEEC) are used to prevent or, if that is not practicable, to minimize the release of prescribed substances into the medium for which they are prescribed; and to render harmless both any prescribed substances which are released and any other substances which might cause harm;
- releases do not cause, or contribute to, the breach of any direction given by the Secretary of State to implement European Community or international obligations relating to environmental protection, or any statutory environmental quality standards or objectives, or other statutory limits or requirements;
- when a process is likely to involve releases into more than one environmental medium, the best practicable environmental option (BPEO) is achieved; i.e. the releases from the process are controlled through the use of BATNEEC to give the least overall affect on the environment as a whole.

BATNEEC

The Department of Environment, in its publication *Integrated Pollution Control – a Practical Guide*,[3] provides some useful definitions to explain what is meant by Best Available Techniques Not Entailing Excessive Cost:

- "Best" must be taken to mean most effective in preventing, minimizing, or rendering harmless polluting releases. There may be more than one set of techniques that achieve comparable effectiveness – that is, there may be more than one set of "best" techniques.
- "Available" is taken to mean procurable by the operator of the process in question. The technique may not be in general use, but it must be generally accessible. It does not imply that sources outside the UK are unavailable.
- The term "techniques" is defined in the Act. It embraces both the plant in which the process is carried on and the manner in which that process is operated. It is not sufficient to have in place the most sophisticated, state-of-the art-plant; it must also be operated to ensure that it delivers the best possible performance at all times.
- "Not entailing excessive cost" needs to be taken in two contexts, depending on whether it is applied to new or existing processes. Nevertheless, in all cases BAT can properly be modified by economic considerations where the costs of applying the best available techniques would be excessive in relation to the nature of the industry and to the environmental protection to be achieved.

In relation to existing processes, applicants for authorizations are required to explain how their plants will be upgraded to achieve the same standards as would be expected of new plant. They also need to justify any delay in complying with such standards.

Assessment of harm

When Integrated Pollution Control was first introduced in April 1991, only general guidance was available on how environmental assessments for IPC should be conducted. Several fundamental questions were posed by the legislation and accompanying regulations. For example, how should an operator demonstrate that the choice of process represented the Best Practicable Environmental Option? Also, what kind of environmental information should an operator provide to demonstrate that there are no harmful effects on the environment? And how should Inspectors use this information in determining an IPC application?

Within the context of the Environmental Protection Act, "harm" means "harm to the health of living organisms or other interference with the ecological systems of which they form a part and, in the case of man, includes offence caused to any of his senses or harm to his property; and 'harmless' has a corresponding meaning."

However, the Act does not define the nature of the effects which may be considered harmful or the level in the environment at which they may occur. Therefore, a practical approach to the assessment of harm had to be devised:

In this approach, an "intolerable level" is defined equivalent to any statutory limit such as an Environmental Quality Standard for releases to air or an Environmental Quality Objective for those to water. In the absence of a statutory limit for a substance, an interim "Environmental Assessment Level" (EAL) would be set by HMIP. The EAL would provide guidance to operators and Inspectors on the maximum environmental concentration of a pollutant which is consistent with the condition of harmlessness mentioned above.

A "threshold value" is also defined to help determine whether or not a release is significant. This value is set at a level where one can be confident that the effect on the environment is negligible. An example might be a value of 0.2 per cent of the EQS (or EAL). Again, the threshold value would be developed by HMIP as a guide to operators and site Inspectors.

Best Practicable Environmental Option (BPEO)

Where a process involves the release of substances to more than one environmental medium, the Inspector needs to determine whether the proposed operation represents the BPEO for the pollutants concerned.

The BPEO can be considered as "the outcome of a systematic consultative and decision-making procedure which emphasizes the protection and conservation of the environment across land, air and water. The BPEO procedure establishes, for a given set of objectives, the option that provides the most benefit or least damage to the environment as a whole, at acceptable cost, in the long term as well as the short term."

No formal rule for selecting the BPEO option can be prescribed. Expert judgement will almost always be necessary. However, the assessment of cost-effectiveness assists the operator by identifying a "break-point" where the costs of further reductions in pollution potential start to rise significantly. To analyse cost-effectiveness, it is important to have a quantitative measure of the environmental consequences of the releases involved: for example, information on the relative harm of different releases to derive an integrated environmental index.

Figure 1
Principles for establishing the site-specific BATNEEC option

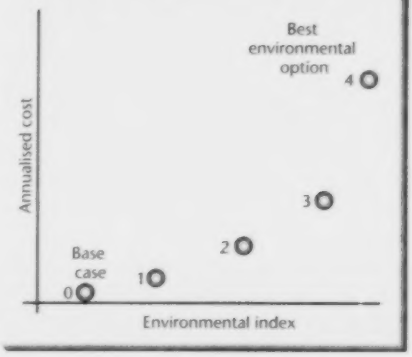


Figure 1 shows the costs and environmental effects (indices) for a range of different process options/techniques, labelled 0 to 4, for a hypothetical product. The environmental index is calculated, for each option, from the environmental concentration which would result from releases to each medium. The current operation is the base case. The process operator might contend that Option 3 of Figure 1 represents the site-specific BPEO, even though Option 4 has a better environmental index value, on the basis of the higher incremental cost entailed in attaining the environmental benefit of Option 4.

Challenges to the regulators

From the above description of what Integrated Pollution Control entails, one can appreciate that the enforcement of IPC has required HMIP to:
1) become more knowledgeable about industrial processes and their effects on the environment;
2) develop professional skills in applying this knowledge in a professional and consistent manner; and
3) operate in an open and transparent way.

The ways in which HMIP has tackled these challenges is described below.

Specialist knowledge

Support provided by research

Research carried out by HMIP is aimed at supporting the work of the Inspectors. It investigates methods of characterizing and quantifying the impact of pollutants on air, land or water to allow comparative evaluation of cross-media process options. It also assesses the impact of alternative radioactive waste disposal systems. But the main focus of the research programme in recent years has been the accumulation of knowledge about the technology available for pollution abatement of industrial processes, with a view to providing Inspectors with guidelines on internationally recognized standards of good practice.

Chief Inspector's Guidance Notes

Process operators, and indeed the public, require an assurance that HMIP's requirement for industry to employ best available technology, not entailing excessive cost, is applied in a rational and consistent way. BATNEEC standards for each class of IPC process are therefore set out in published Guidance Notes which provide Inspectors (and industry) with the main emission standards for prescribed substances arising from each process. They also outline the minimum standards expected to be attained by existing plant, as well as what constitutes BATNEEC for new plant and processes.

The Guidance Notes take into consideration the results of BAT research reviews that have been commissioned by the Inspectorate and are submitted to industry and environmental groups for comment before publishing. A wide range of reviews of BAT have so far been carried out. Among other things, the notes give guidance on:

- the general provisions of IPC;
- the timescale for updating existing plants to new plant standards;
- definition of substantial change;
- BATNEEC/BPEO process/abatement techniques;
- release levels corresponding to those techniques; and
- compliance monitoring.

Professionalism

Competence of Inspectors

To authorize an IPC process in accordance with the BPEO (and BATNEEC) objective, it is necessary to know about alternative means of operating a process, and to be able to assess the environmental consequences of releases from the different options. The Inspectors must therefore have good scientific and technological skills. Since they must be able to discuss processes in detail with managers of industry, it is desirable that they be familiar with industry and its problems. HMIP requires that applicants for posts as Inspectors have a minimum of five years of industrial experience. This requirement means, of course, that HMIP has to be prepared to pay salaries comparable to those in industry so as to attract suitable candidates.

HMIP conducts intensive training courses for new Inspectors covering all aspects of their duties, the relevant legislation, case histories, and scientific theory. Other training courses prepare Inspectors for the process of presenting evidence at law courts through realistic role-playing exercises at mock court hearings.

Perhaps the most innovative contribution to improving the competence of Inspectors has been the establishment, jointly with the University of Manchester Institute for Science and Technology, of a Master of Science Degree Course in Integrated Pollution Management. Half of the students on a typical course are pollution Inspectors within HMIP, the other half being graduates in a degree course in environmental protection or related science.

The international dimension

The Inspectorate is conscious of the professional work in pollution control carried out by many countries. It therefore seeks to exchange information and compare practices with other national Inspectorates. A particularly useful forum for such work is the EU Network for the Implementation and Enforcement of Environmental Legislation (the IMPEL Network), which was set up in 1992 in response to concerns that differences in regulatory controls in Member States could be damaging to the environment and to industry.

1. IPEL's aims are:

- to help ensure a more effective application of environmental legislation, at national and local levels, by promoting exchange of information and experience, and by developing a greater consistency of approach in the implementation, application and enforcement of environmental legislation, with a special emphasis on European Community legislation but also covering national legislation;
- to provide a framework for policy-makers, environment Inspectors and enforcement officers to exchange ideas, encourage the development of enforcement structures, and discuss best practices; and
- to provide feedback on the implementation and enforcement of legislation which will be of benefit to legislators and policy-makers at Community and national levels in preparing new legislation.

Annex
Prescribed substances

Release to air: prescribed substances	Release to water: prescribed substances	Release to land: prescribed substances
Oxides of sulphur and other sulphur compounds	Mercury and its compounds	Organic solvents
Oxides of nitrogen and other nitrogen compounds	Cadmium and its compounds	Azides
Oxides of carbon	All isomers of hexachlorocyclohexane	Halogens and their covalent compounds
Organic compounds and partial oxidation products	All isomers of DDT	Metal carbonyls
Metals, metalloids and their compounds	Pentachlorophenol and its compounds	Organo-metallic compounds
Asbestos (suspended particulate matter and fibres), glass fibres and mineral fibres	Hexachlorobenzene	Oxidizing agents
Halogens and their compounds	Hexachlorobutadiene	Polychlorinated dibenzofuran and any congener thereof
Phosphorus and its compounds	Aldrin	Polychlorinated dibenzo-p-dioxin and any other congener thereof
Particulate matter	Dieldrin	Polyhalogenated biphenyls, terphenyls and naphthalenes
	Endrin	Phosphorus
	Polychlorinated Biphenyls	Pesticides, i.e., any chemical substance or preparation prepared or used for destroying any pest, including those used for protecting plants or wood or other plant products from harmful organisms; regulating the growth of plants; giving protection against harmful or unwanted effects on water systems, buildings or other structures, or on manufactured products; or protecting animals against ectoparasites.
	Dichlorvos	
	1,2-Dichloroethane	
	All isomers of Trichlorobenzene	
	Atrazine	
	Simazine	
	Tributyltin compounds	
	Triphenyltin compounds	
	Trifluralin	
	Fenitrothion	
	Azinphos-methyl	
	Malathion	
	Endosulfan	Alkali metals and their oxides and alkaline earth metals and their oxides.

Consistency

The UK system of authorization and enforcement gives an HMIP Inspector a great deal of authority in setting criteria which must be met by the operator of a process. However, it is important that the Inspectorate, as a whole, is consistent in the way it deals with similar industries throughout the county. To help ensure this consistency, the Inspectorate established an Operations Support Branch as a bridge between headquarters staff involved with regulatory policy and the field staff responsible for implementing regulations.

Another aspect of consistency concerns the appraisal of operators – the Inspector, during a site visit, is required to form an opinion not only on the physical state of the plant, but on the competency of the process operator. To avoid such an appraisal being purely subjective, HMIP has drawn up seven key indicators of Operator Performance Appraisal:

- compliance with limits and adequacy of records;
- knowledge of authorization requirements and implementation;
- plant maintenance and operation;
- management and training;
- procedures and instructions;
- frequency of incidents and justified complaints;
- auditable environmental/management systems.

Guidance is provided to Inspectors to assist them in making the assessment in a consistent way. Inspectors are required to complete a record sheet at the end of each inspection visit in discussion with the operator. HMIP believes that the appraisal system works best if there is transparency between Inspectors and Operators, and if the system is fully understood by all parties. However, the Inspector has the responsibility for the final values entered into the record.

Review of HMIP's performance

In 1994, HMIP arranged for an independent advisory committee to be set up to examine ways of helping the Inspectorate improve further the effectiveness of its performance. In December 1995, this committee made a number of observations concerning ways in which the Inspectorate might enhance its efficiency and effectiveness. It also made a number of helpful recommendations in the areas of performance indicators, corporate planning, risk assessment, charging schemes, check monitoring, guidance to industry, and consultation with customers.

Openness

The Citizen's Charter

The Government has sought to raise the standard of public services in the 1990s through the inauguration of the "Citizen's Charter" in 1991. In 1993, it also published a code for enforcement agencies called "Working with Business". HMIP has responded to these two government ventures by publishing a Charter Statement entitled "Pollution Prevention: Our Common Concern,"[4] to demonstrate our continuing commitment to provide an efficient, professional service for our customers and the general public.

This Statement declares that "HMIP protects the environment by enforcing regulations to prevent pollution." It describes the types and standards of service that the public should expect from HMIP, and explains what people should do if they feel the quality of service falls below the proper standard.

Publishing of data

HMIP is very aware of that fact that it has an obligation to serve the public:

- by taking into account specific comment on individual applications for authorization;
- by ensuring that operators provide data which demonstrate their compliance with the terms of their authorizations; and
- by the provision and maintenance of the public registers.

HMIP publishes regular accounts of its work in the form of quarterly statistical report in which details of the Inspectorate's performance, staffing and costs appear. It also issues an annual monitoring report on the use and storage of radioactive materials and a regular fact sheet that keeps industry informed about the latest developments.

To help the public obtain information on the operation of HMIP, a semi-automatic fax retrieval service has been set up offering copies of documents containing statistics on HMIP's performance and on various environmental parameters.

HMIP has also set up a press office to respond to questions from the public and to provide information on issues such as enforcement orders and prosecutions undertaken by HMIP.

Conclusions

The problems of improving the environment without crippling industry are common to most, if not all, countries. The experience of HMIP in applying Integrated Pollution Control over the

past few years has convinced the authors that IPC can help solve these problems. We are pleased, therefore, that the European Community has developed the Integrated Pollution Prevention and Control Directive. It is anticipated that this legislation will be adopted early in 1996 and will come into effect three years later – allowing Member States time to transpose the Directive into national law. Some countries outside the EU are also adopting legislation requiring IPC.

We would not claim that the benefits of IPC are immediate. Its initiation requires regulators to develop new competencies as well as greater openness with the public. We in HMIP are still coming to grips with these challenges. We look forward to working with the inspectorates of other countries, within and outside the European Community, to improve our skills and to exchange information. We are certain that such cooperation can maximize the benefits to the environment and to industry which IPC can provide.

Notes

1. The Environmental Protection Act (1990) HMSO.
2. The Environmental Protection (Prescribed Processes and Substances) Regulations 1991 SI No 472, as amended by the Environmental Protection (Prescribed Processes and Substances) (Amendment) Regulations 1992, SI No 614, HMSO.
3. *Integrated Pollution Control – A Practical Guide*, Department of the Environment, Marsham Street, London.
4. The Charter Statement of HMIP: "Pollution Prevention: Our Common Concern", Department of the Environment, Marsham Street, London. ◆

Industry Environmental Compliance: A Training Manual

Over the last few years, many governments have established environmental laws and regulations to protect their country's environment and provide a level playing field for industry competition. But the institutional capacities needed to ensure that all companies are complying equally with the environmental standards are often weak or lacking.

UNEP IE has produced a training manual to help governments develop their institutional ability to ensure industry compliance with the country's environmental standards. *Industry Environmental Compliance: A Training Manual* provides the context, examines different approaches, identifies critical elements of success and discusses options when resources are limited in developing an effective compliance and enforcement programme. It promotes an integrated approach to help steer industry towards cleaner production options rather than end-of-pipe solutions to meet environmental requirements.

The training manual consists of four separate modules. The first module on institutional aspects examines:

- why an effective compliance and enforcement programme is important;
- its objectives and functions;
- its optimal hierarchical position, degree of centralization and integration;
- the optimal balance between the inspection, permit and enforcement functions;
- the necessary interaction among government bodies, industry and the public;
- how to establish priorities and evaluate success; and
- how to phase-in functions as resources become available.

The second module focuses on permits and provides answers to such questions as:

- what is an environmental permit, its role, its content?
- who should be required to have a permit, who should issue it, and what criteria should it be based upon?
- how to make the permit enforceable, and what to do when laws or regulations are imprecise;
- what to do when resources are limited, and how to introduce integrated permits.

How to monitor compliance and enforce compliance is covered in the third module. Three sections focus on industry self-monitoring, government inspections and enforcement, covering issues such as:

- who should be required to self-monitor what, how and when;
- how to adopt an integrated approach to self-monitoring;
- how to develop an inspection strategy and what guidance to provide to inspectors;
- how to convert to integrated inspections;
- how to develop an enforcement strategy with appropriate responses to different violations; and
- what options exist when resources are limited.

The fourth module deals with human and financial resources. It examines:

- the types of resources needed for different functions; and
- the funding options.

The appendices include:

- a case study of a fictitious country providing a discussion of common problems governments encounter in each of these four areas; and
- a summary of the key points of each module in a form which can be easily photocopied onto overheads.

The training manual can be used for individual study or for group training in local, regional, national or international settings. It complements an earlier UNEP IE publication, *From Regulations to Industry Compliance: Building Institutional Capabilities*, which prompted worldwide interest and requests for assistance to put its principles into practice. The training manual has already been successfully used to run a training programme in China for governments of rapidly industrializing Asian countries.

The training manual is now available from UNEP IE. Requests for UNEP IE assistance in carrying out the training programmes may also be considered.

Industry's responses to comply with environmental laws and regulations

Björn Sveen, Assistant Director Pollution Control, NHO Confederation of Norwegian Industry, Postboks 5250 Majorstua, N-0303 Oslo 3, Norway

Abstract
The backbone of industry's compliance with environmental regulations will always be self-monitoring, based on an internal control system. Inspections by authorities are necessary to enforce a high degree of compliance on a continuous basis, and also to improve permits with clearer wording. Inspections are very effective in getting large companies to comply, but seem to be of less value in regard to the many thousands of small emitters.

Résumé
La clef de voûte du respect des réglementations environnementales par le secteur industriel sera toujours l'autocontrôle, fondé sur un système de contrôle interne. Les inspections par les autorités sont nécessaires pour garantir la continuité d'une stricte conformité à long terme, et également pour améliorer les autorisations en reformulant les textes avec plus de clarté. Les inspections s'avèrent très efficaces pour mettre les grandes entreprises en conformité, bien que leur portée semble amoindrie vis-à-vis des milliers de petits pollueurs.

Resumen
La piedra angular del cumplimiento de las leyes medioambientales por parte de la industria se basa en un sistema de control interno, de autosupervisión. Se requiere que las autoridades competentes realicen inspecciones regulares para reforzar el grado de cumplimiento sobre una base continua, así como para que los permisos otorgados tengan una redacción más clara. Las inspecciones son muy eficaces cuando se trata del cumplimiento por parte de las grandes sociedades, pero parecen ser menos válidas en el caso de miles de pequeños contaminadores

In the 1960s, when the first environmental regulations were issued to the Norwegian primary aluminium industry, monitoring compliance was not a priority issue. Treatment processes were still in the early development stages, and equipment generally had to be built *in situ* on a trial and error basis.

Nor in the 1970s, when permits were written on a large scale for all industry, were inspection and enforcement given much attention. The main issue was to see that all manufacturing plants installed the specified treatment plants or changed their processes within the given time limits. Personnel from industry and the Federal Pollution Control Authority (SFT) cooperated on a collegial basis to develop remedies against emissions. Enforcement was seldom necessary. Only after repeated reminders were companies that were wilfully neglecting orders to install known technology fined. The authorities found it necessary to use fines, especially within the potato processing industry.

Federal inspection scheme

By the mid 1980s the majority of all companies had installed treatment plants, and emissions had been reduced by 60-90 per cent. But by then it had also become apparent that many companies did not run their treatment plants to the optimally on a continuous basis. Emission limits were often exceeded and spills occurred frequently. The SFT then worked out an inspection scheme with the aim of achieving better compliance.

Some 1500 enterprises in Norway have integrated emission permits covering sewage, air, noise, waste, and spill protection. All other enterprises are of course subject to general regulations for hazardous waste disposal, noise, chemicals, product labelling, etc. Enterprises with emission permits are divided into three inspection classes, based on their theoretical pollution potential:

Class 1: Pulp and paper, metallurgical, chemical, oil production platforms, etc.

Class 2: Mines, foundries, large food processing, etc.

Class 3: Dairies, slaughterhouses, plating shops, etc.

Classes 1, 2 and 3 (approximately 500 enterprises) are monitored on a regular basis, i.e., there are:

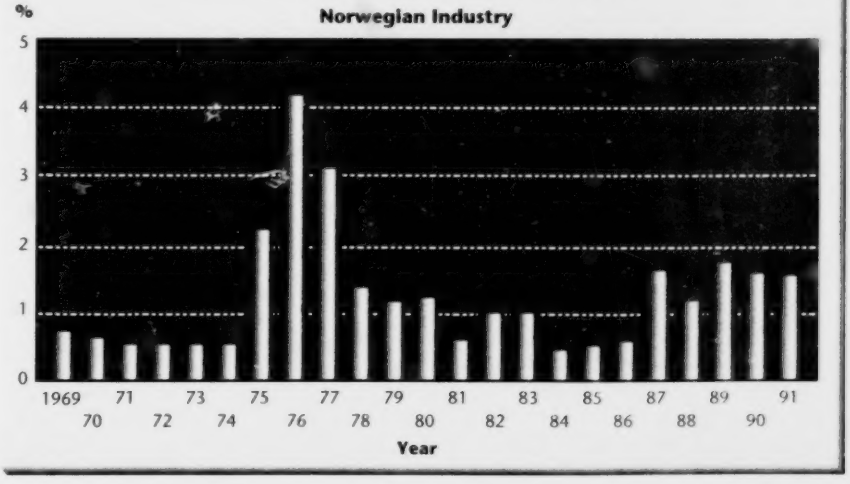
- written reports to the authority once a year;
- unannounced inspections annually or bi-annually;
- thorough audits of the environmental management system, with frequency depending upon class and "compliance history" – in general, every three to six years.

When inspections started, it also turned out that many permits had to be rewritten to make it clear to the holder what was meant and to define a basis for enforcement.

A wave of public interest in environmental affairs at the time helped a lot in the compliance drive. The authority was as much criticized as the industry. Forgotten inspection reports, spills, pollution fines, and actions by environmental activists were given wide attention by the news media. Most large companies, aware of their public image, were quick to set right the lacking environmental management. But it was a long time before the inspection department of SFT got around to visiting all companies in Classes 1, 2 and 3. Even now, in the mid 1990s, many small enterprises with a permit have never been visited by a pollution control inspector.

Inspections and enforcement are no doubt necessary to achieve compliance with environ-

Figure 1
Environmental investments as percentage of GNP



mental regulations. But there is a difference in effect on large and small enterprises. A large company with a professional environmental staff will have the capacity to set things right and to maintain standards once definitions are agreed upon. A large company will also have the administrative capacity to integrate environmental responsibilities into its management set-up and strategic planning. On the other hand, smaller enterprises live more on a day-to-day basis and may not always have the capacity to give 100 per cent of their attention to environmental considerations. Also, if an inspection regime is developed based on experience with large companies, it tends to grow "academic and bureaucratic". When inspecting smaller enterprises, a different "language and magnitude" needs to be used. Otherwise, a widespread negative attitude towards authorities and environmental needs may result.

Negative official reports lead to disillusioned environmental officers

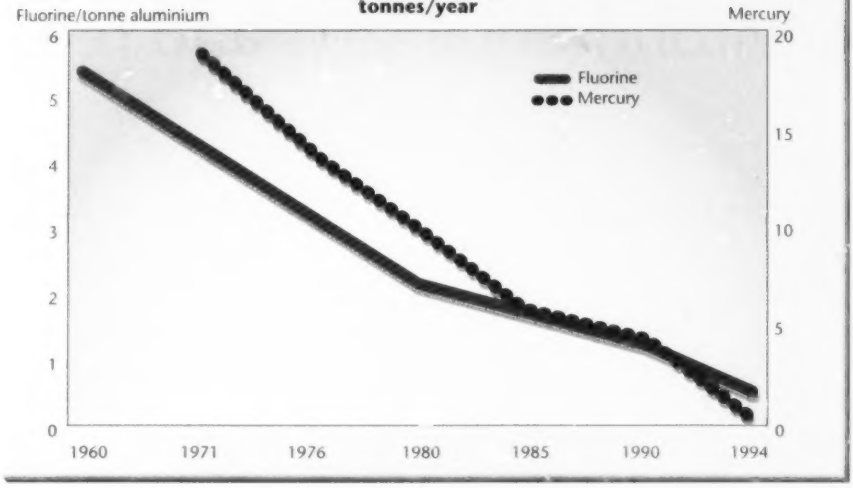
Media coverage seems to be as important to pollution inspectorates as it is to politicians and movie stars. And since it is always easier to get coverage for non-compliance and breaking environmental laws, the official annual reports from SFT tended to contain utterly negative information. With the years many enterprises grew disillusioned with trying to achieve compliance. What was good enough one year was not satisfactory to the inspectors the next year – without any notice, the standards had been tightened. Although agreeing that Norwegian industry had done a spectacular job in installing environmental equipment and making efforts to stay in compliance with permits and regulations, it seemed to be very hard to say so in the annual reports.

Our Pollution Control Authority wisely limited its inspection activities to the approximately 500 largest companies with emission permits. The many thousands of mainly small enterprises emitting to air and water would have to be left to other ways of achieving compliance.

Development: integration of health-environment-safety

Since 1992, an "Internal Control" regulation has been in effect obliging all business – and now even municipalities - to have written procedures for all operations. It specifies responsibilities, maintenance schedules, actions to be taken in case of malfunction, spills, etc. Companies should also specify how they plan to achieve better results on a continuous basis. The regulation covers not only environmental control, but also electrical, fire and combustible media handling, and occupational health and safety regulations. Although tending to be bureaucratic, especially in the view of small enterprises, the Internal Control regulation gives the industry a sound management tool for HES considerations if it is used. It leaves it to the inspection authorities to check if the procedures and plans are specified in writing, and if they are followed. If so, it is left to the company to monitor effluents and the content of hazardous wastes. The challenge to the different inspectorates is to work, i.e. inspect, together and not continue operating in an uncoordinated manner, checking more or less the same management issues. Time-consuming audits in particular, will have to be coordinated.

Figure 2
Industry emissions
tonnes/year

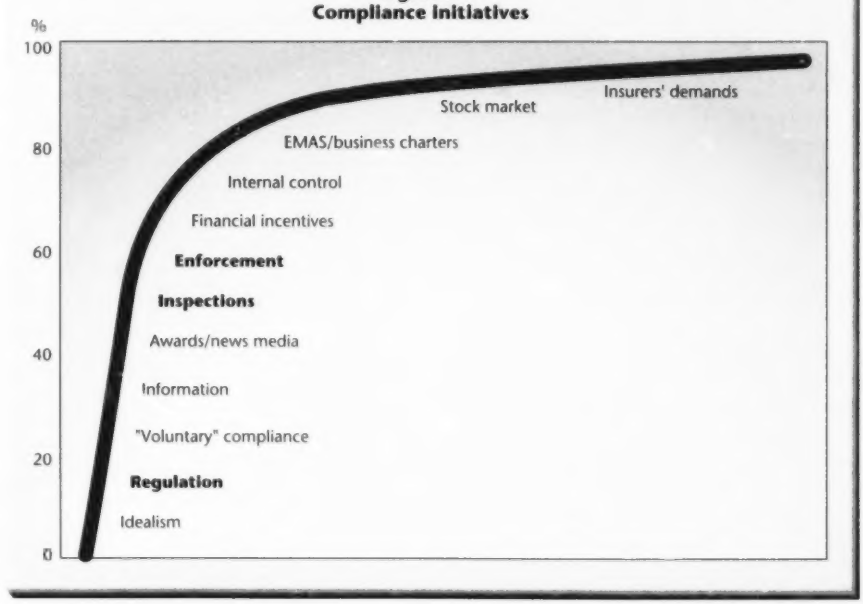


How to achieve 100 per cent compliance

There are many "influencing tools" that may be used when full compliance with an environmental goal is sought. Regulations, inspections, and law enforcement are but three. Information, awards, bench-marking, negative and positive media coverage, membership in business charters and idealistic organizations, voluntary financial incentives, consumer, insurers, bankers power, etc. are others. They all have an effect at different stages of compliance.

Based solely on inspection and legal enforcement, 100 per cent compliance will never be obtained – whether it be speeding or pollution. Information aimed at a widespread change of attitude towards the need for emission control is, in my opinion, the most important. In the future we will see more self-disciplining business schemes like Cefic's Responsible Care (in Norway, the MIA programme) or the EU's EMAS register. These schemes will have a domino effect on other companies, especially on smaller enterprises which are suppliers to large companies and governments. Registered members will demand information on suppliers' internal control management and hazardous waste handling. Thus EMAS registered companies, insurers and the stock market may add to the inspecting role of regulatory authorities. The main difference between the "private" and governmental monitoring systems lies in the use of positive incentives. Acquiring the MIA Seal or EMAS registration, as well as winning suppliers' contracts based on a good HES standard, is good PR. ◆

Figure 3
Compliance initiatives



La politique française de l'environnement industriel : vers le développement de relais à l'action publique classique

François Durand Service de l'environnement industriel, Direction de la prévention des pollutions et des risques, Ministère de l'Environnement, 20 avenue de Ségur, 75302 Paris 07 SP, France

Résumé

En France, c'est l'Etat qui fixe les règles que l'industrie doit respecter à l'égard de l'environnement. Ces règles ont pour base juridique la législation des installations classées qui s'appuie sur le contrôle intégré des pollutions et des risques. Ce système est complété par une taxation des pollutions.

A côté de ce dispositif classique, l'Etat met en place des relais à son action de contrôle.

Il existe une demande croissante d'informations en provenance des partenaires économiques et du public sur le respect de l'environnement par l'entreprise. Il importe que l'Etat sache utiliser ce besoin en créant ou en favorisant les relais à son action comme il l'a fait par exemple en rendant obligatoire lors de la vente de terrains industriels l'information de l'acheteur par le vendeur sur le degré de pollution du site.

Abstract

In France it is the State which sets the environmental ground rules which industry must follow. The legal basis for those rules is the legislation covering installations classified as hazardous, which is founded on the integrated control of pollution and risk. This system is supplemented by taxation on pollution.

Alongside this conventional system, the government is putting in place a number of mechanisms to extend the coverage of its powers of control.

There is growing demand from economic partners and the general public for the provision of information on the extent to which the corporate sector ensures that the environment is protected. It is important for the State to put this to good use by instituting or encouraging measures to extend the effects of its powers, as it has already done, for example, by making mandatory the provision of information to the buyer by the vendor on the pollution levels of industrial land at the time of purchase.

Resumen

En Francia, es el Estado quien estipula las reglas que la industria debe respetar sobre el medio ambiente. Estas reglas tienen como base jurídica la legislación de las instalaciones clasificadas, que se fundamentan en el control integrado de las contaminaciones y de los riesgos. Este sistema es completado por una tasación de las contaminaciones.

Al lado de este dispositivo convencional, el Estado implanta relevos a su acción de control.

Existe una demanda creciente de informaciones por parte de copartícipes económicos y del público sobre el respeto del Medio Ambiente por la empresa. Es importante que el Estado sepa utilizar esta necesidad creando o favoreciendo los relevos para su acción como lo ha hecho, por ejemplo, en la venta de terrenos industriales, haciendo obligatorio que el vendedor informe al comprador sobre el grado de contaminación del emplazamiento.

La prévention des pollutions et risques industriels repose en France sur l'Etat. C'est l'Etat qui élabore la politique de l'environnement industriel et qui la met en oeuvre.

A côté de l'action réglementaire traditionnelle, la France a comme tous les pays industrialisés complété son dispositif juridique par l'incitation financière basée sur le principe pollueur-payeur.

Mais les pouvoirs publics n'ont pas la possibilité matérielle de tout surveiller et de tout contrôler.

Avec le développement de la sensibilité environnementale, les partenaires de l'entreprise et le public souhaitent être informés sur la manière dont les entreprises respectent l'environnement : c'est la raison pour laquelle les pouvoirs publics doivent favoriser le développement de ces relais à leur action traditionnelle.

L'article ci-dessous expose en premier lieu les moyens traditionnels de l'action publique : les règlements et l'incitation financière. En second lieu, il examine les relais à l'action publique, actuels et futurs, qui seront autant de moyens efficaces pour le respect des lois environnementales.

1. Les moyens classiques de l'action publique

L'action publique en matière d'environnement comprend habituellement :

- l'instrument réglementaire
- l'incitation financière.

La plupart des politiques de prévention des pollutions combine ces deux instruments. Il est difficile de savoir ce que serait l'un sans l'autre. Il y a sans aucun doute complémentarité.

Historiquement, l'action publique a d'abord mis en place l'instrument réglementaire (un décret de 1810 soumet à un régime juridique d'autorisation les activités industrielles dangereuses). Cet instrument réglementaire a évolué au cours du XX^{ème} siècle tout en conservant des caractéristiques bien françaises fondées sur une structure centralisatrice forte. Ce n'est que dans les trente dernières années que l'instrument financier est venu compléter le dispositif réglementaire.

1.1. L'instrument réglementaire

La loi du 19 juillet 1976 relative aux installations classées pour la protection de l'environnement est la base juridique de la politique de l'environnement industriel en France.

En-dehors des installations nucléaires et des mines (qui relèvent d'autres législations), elle vise toutes les activités industrielles, les élevages intensifs et les activités de traitement de déchets.

Cette loi a succédé à une loi de 1917, et cette dernière à un décret de 1810.

1.1.1. Une approche intégrée

La législation relative aux installations classées est fondée sur l'approche intégrée. Ce qui signifie que :

- une seule autorisation est délivrée pour un site industriel au titre de la protection de l'environnement (et non pas plusieurs autorisations, dont une autorisation pour les rejets liquides, une pour les rejets gazeux, une pour le risque, etc.). L'approche intégrée permet la prise en compte de tous les impacts sur l'environnement (air, eau, sol, bruit, vibrations) et du risque industriel. C'est là une distinction par rapport à la directive IPPC (contrôle et prévention intégrés des pollutions) qui met en place au niveau de l'Union européenne une législation semblable au système français mais qui écarte le risque industriel (celui-ci relève de la directive Seveso). Il semble cependant que pollution et risque d'accident sont des notions inséparables pour l'environnement et que leur prise en compte dans une même et seule législation soit pertinente ;
- une seule autorité est compétente pour l'application de cette législation. Il existe en effet la possibilité de voir plusieurs entités juridiques – Etat, région, département, commune – intervenir

simultanément dans le cadre d'une même police. En France, seul l'Etat est compétent en matière de législation des installations classées. L'Etat intervient par l'intermédiaire du préfet qui est son représentant dans chacun des 100 départements français. Le préfet est bien sûr assisté de services techniques. La tradition française de l'organisation des pouvoirs publics est caractérisée par une forte centralisation. Cela est très utile et efficace en matière d'environnement industriel où l'Etat est plus à l'aise que des collectivités locales pour assurer l'application d'une telle législation. Il faut savoir que la centralisation ne signifie pas l'instruction des dossiers par un ministère à Paris : toutes les affaires sont traitées au niveau des départements par le préfet et ses services.

1.1.2. Le système juridique

La législation des installations classées met en place un système simple. Les activités industrielles qui relèvent de cette législation sont énumérées dans une nomenclature qui les soumet soit à un régime d'autorisation, soit à un régime de déclaration.

- la déclaration (qui est une notification) concerne les activités les moins polluantes ou les moins dangereuses. Elle consiste à faire connaître au préfet son activité (le préfet remet alors un récépissé de déclaration) et à respecter des prescriptions standardisées.
- l'autorisation concerne les activités les plus polluantes ou les plus dangereuses. Le principe de l'autorisation n'est pas anodin en pays d'économie libérale puisqu'il soumet la création d'activités économiques créatrices de richesses à un permis accordé au titre de la protection de l'environnement.

La procédure d'autorisation débute par la constitution d'un dossier de demande d'autorisation où figurent l'étude d'impact et l'étude de dangers. Ces deux documents sont fondamentaux. Le dossier est ensuite instruit par les services du préfet. Il est soumis à diverses consultations et notamment à une consultation du public (c'est l'enquête publique). La procédure se termine par la délivrance (ou le refus) de l'autorisation sous la forme d'un arrêté du préfet qui contient les prescriptions (par exemple pour les rejets : les valeurs-limites de concentrations et de flux des divers polluants) que doit respecter l'industriel.

Par rapport aux prescriptions de la déclaration qui sont standardisées, les prescriptions de l'autorisation son élaborées au cas par cas, sur mesure.

Soulignons encore une fois que c'est le préfet qui est l'autorité compétente en matière de législation des installations classées et qui, en tant que tel, fixe les prescriptions.

Cependant, le ministre chargé des installations classées, qui est le ministre de l'environnement, peut donner des instructions aux préfets. Ces instructions prennent souvent la forme d'arrêtés ministériels qui fixent par exemple les dispositions minimales que doivent reprendre les arrêtés d'autorisation. En fonction de la sensibilité de l'environnement de l'installation autorisée, les prescriptions de l'arrêté d'autorisation peuvent être plus contraignantes. Le plus connu des arrêtés ministériels fixant des prescriptions techniques est l'arrêté ministériel du 1er mars 1993, dit arrêté intégré, qui concerne un grand nombre d'activités industrielles.

L'autorité compétente dispose de nombreux moyens de sanctions administratives (mise en demeure, consignation de sommes, exécution d'office, suspension de l'autorisation, fermeture) en cas de non-respect des prescriptions. Elle peut par ailleurs modifier ces prescriptions.

Il existe également toute une panoplie de sanctions pénales qui peuvent être utilisées dans ce cas. C'est alors le juge qui intervient.

Soulignons enfin un principe essentiel : le droit des tiers est toujours préservé. Cela signifie que même si l'industriel respecte la réglementation, dans la mesure où un tiers est victime de l'activité

Les accords volontaires : les limites d'un substitut à la réglementation

Pour mettre en place des mesures de protection de l'environnement en entreprise trois sortes de voies peuvent être utilisées :- celle de la réglementation, à l'initiative des pouvoirs publics,

- la voie volontaire, à l'initiative de l'entreprise,
- l'accord avec les pouvoirs publics. Dans ce cas-là, la contrainte fait place au contrat. Contrat puisque c'est le résultat de l'accord des deux parties, l'entreprise et l'Etat (l'accord peut porter d'autres dénominations : charte, contrat, engagement volontaire, etc. ; il peut être le fait d'une entreprise, d'un secteur industriel, d'une collectivité locale, etc.).

Pendant les années 70 (alors que le ministère de l'environnement était encore débutant), des contrats ont été conclus entre l'Etat et les branches industrielles afin de réduire les pollutions.

Depuis, l'approche par accord volontaire s'est limitée à des domaines où l'Etat ne souhaite pas intervenir réglementairement, soit parce que les enjeux sont nouveaux (par exemple, la réduction des rejets de gaz carbonique et de la consommation d'énergie), soit parce que l'intérêt économique de l'entreprise permet de se passer de l'obligation réglementaire (par exemple, politique des entreprises en matière de recyclage des produits, des emballages).

Les accords volontaires sont généralement dépourvus d'une sanction quelconque en cas de non-respect. Il faut aussi souligner que bien souvent les industriels n'adhèrent à une telle démarche volontaire que sous la menace d'un règlement ou d'une taxation à venir.

Ce type de démarche, judicieusement utilisé, c'est-à-dire dans des cas où les deux parties, l'entreprise et l'Etat, y trouvent leur avantage, peut se révéler efficace. Cela peut être le cas par exemple en matière de politique de réduction des emballages, de recyclage des produits ou de décontamination de sites à pollution historique.

L'Etat
- élabore les règlements obligatoires
- contrôle leur application
- fixe les taxations

Action classique de l'Etat

L'entreprise
- respecte les règlements obligatoires
- paye les taxations
- met en place une politique de l'environnement (facultatif)

L'approche intégrée, c'est une autorisation unique délivrée par une autorité unique. Ici une usine de pâte à papier (photo F. DURAND)

industrielle et subit un dommage, ce tiers peut réclamer réparation devant le juge. C'est alors le droit privé qui intervient.

1.2. L'incitation financière

Le principe pollueur-payeur est un principe de base en matière de politique de l'environnement.

Il consiste à faire payer le pollueur pour les dommages qu'il cause à l'environnement du fait de son activité et notamment de l'impact des rejets liquides, gazeux, solides (déchets).

Mais soulignons immédiatement que le coût des redevances est nettement inférieur au montant des dommages. Certaines études établissent ainsi un facteur 10 entre le coût de la dépollution et le montant de la redevance et un facteur 100 entre le coût du dommage à l'environnement et le montant de la redevance.

On peut donc dire que ce n'est pas cette taxation qui dissuade le pollueur de polluer.

La taxation est affectée : cela signifie que les redevances approvisionnent un fonds qui est utilisé à aider financièrement les investissements et l'exploitation des équipements de dépollution. C'est là la grande utilité de la taxation de la pollution.

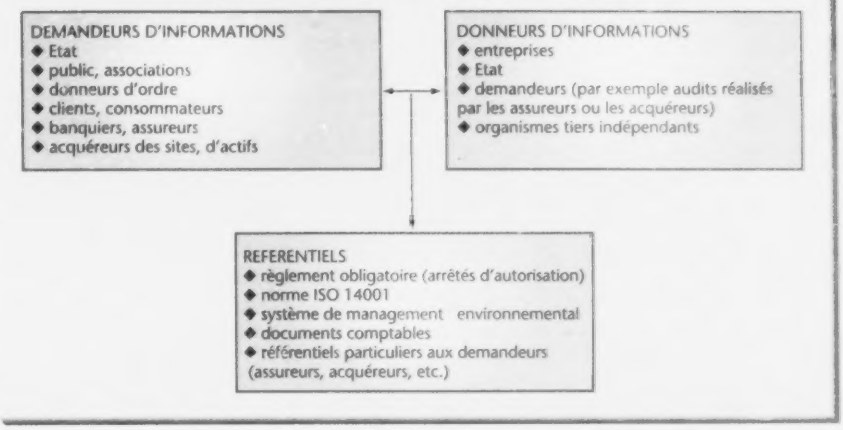
Il existe en France des redevances :

- sur les rejets liquides (six agences de l'eau perçoivent des redevances sur les polluants rejetés et aident les investissements en matière de dépollution de l'eau) ;
- sur les rejets gazeux (c'est l'Agence de l'environnement et de la maîtrise de l'énergie qui intervient) ;
- sur les déchets dangereux (cette taxation se met en place).

L'Etat élabore donc des règlements que l'industriel doit respecter. On sait cependant que ses moyens pour surveiller le respect des règlements sont limités et qu'il ne peut de toute manière tout vérifier et tout contrôler.

En revanche, ce que l'Etat peut faire, c'est favoriser les relais à son action de contrôle.

Diagramme sur l'information concernant le respect de l'environnement par l'entreprise



2. Les relais à l'action publique

L'intérêt pour l'environnement s'est développé à tous les niveaux et aujourd'hui pour diverses raisons, on souhaite savoir si une entreprise respecte l'environnement.

Différents acteurs souhaitent bénéficier d'une telle information. Il peut s'agir :

- de l'Etat ;
- d'acteurs financiers comme les actionnaires, les investisseurs, les assureurs et les banquiers ;
- les donneurs d'ordre et les clients ;
- les tiers victimes potentielles d'une usine polluante ;
- les associations de protection de l'environnement ;
- le public en général
- etc.

Le respect de l'environnement est bien sûr d'abord fondé sur la réglementation. L'entreprise peut cependant aller au-delà en définissant une politique de l'environnement et en se fixant des objectifs. Une telle pratique fait l'objet de normes de management environnemental. Ces référentiels – réglementaire ou normatif – permettent de reconnaître l'entreprise respectueuse de l'environnement (2.1. les références à utiliser).

La vérification de la conformité aux référentiels est d'abord le rôle de l'Etat, lorsqu'il s'agit de la réglementation.

Mais l'Etat peut instituer un relais à son action en obligeant par exemple l'industriel à s'informer sur sa conformité à la réglementation ou sur le degré de pollution d'un terrain lors d'une transaction (2.2. les relais mis en place par la législation).

D'autres relais sont également à favoriser : il existe un besoin croissant d'information sur les relations entre l'entreprise et l'environnement. Ce besoin peut se traduire au niveau contractuel entre l'entreprise et ses partenaires économiques, ou bien ce peut être une initiative de l'entreprise (2.3. les relais à favoriser).

2.1. Les références à utiliser

Selon leur caractère réglementaire ou non, on peut distinguer deux grandes catégories de textes qui vont servir de références au contrôle du respect de l'environnement :

- les prescriptions règlementaires ;
- les références non obligatoires.

2.1.1. Les prescriptions règlementaires

Les prescriptions règlementaires sont contenues dans les textes qui concernent les installations classées. Ce sont des dispositions obligatoires édictées par l'Etat.

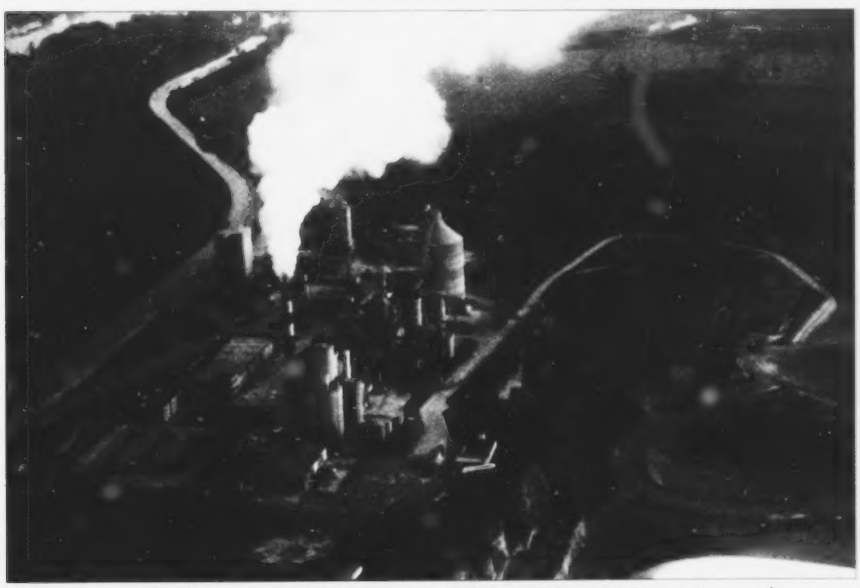
2.1.2. Les références non obligatoires

2.1.2.1. Une référence normative : la norme ISO 14001 « système de management de l'environnement ».

Son application est volontaire.

L'entreprise qui applique cette norme met en oeuvre un système de management de l'environnement et une politique environnementale. Cette politique implique le respect des prescriptions règlementaires.

2.1.2.2. L'éco-audit (système communautaire de management environnemental et d'audit issu du règlement européen du 29 juin 1993).



Les sites industriels (ici une cimenterie) doivent à côté de la réglementation, mettre en place une politique environnementale, basée par exemple sur la norme ISO 14001 (photo F. DURAND)

La conformité au règlement éco-audit implique là aussi que l'entreprise a une politique environnementale faite notamment d'objectifs et de progrès. Elle suppose également un respect de la réglementation.

2.1.2.3. Autres référentiels.
Chacun en fonction de ses besoins peut élaborer son propre référentiel.

Ainsi, l'audit d'acquisition d'un site va s'intéresser particulièrement à l'état du sol et du sous-sol. L'audit d'acquisition d'actifs d'une société pourra s'intéresser aux divers éléments "environnementaux" de l'information financière (provisionnements concernant la dépollution des sols au niveau du bilan, immobilisations concernant la protection de l'environnement, etc.).

L'audit d'assurance se fonde sur la pertinence des prescriptions réglementaires visant à prévenir les accidents et les pollutions accidentelles et à leur respect.

2.2. Les relais mis en place par la législation

Les référentiels concernant l'environnement existent (cf. supra).

Il s'agit maintenant de vérifier leur respect. Ce contrôle est fait traditionnellement par l'Etat. Mais l'Etat lui-même peut obliger l'entreprise à certaines démarches et vérifications où des tiers doivent intervenir.

Ainsi la loi du 19 juillet 1976 a créé trois types d'obligations qui illustrent bien la mise en oeuvre de relais au contrôle public. Il s'agit :

- du contrôle technique des installations classées relevant de la déclaration ;
- de l'obligation d'information du vendeur à l'acheteur ;
- des garanties financières.

2.2.1. Le contrôle technique des installations classées relevant de la déclaration.

L'article 10.2 de la loi prévoit que certaines catégories d'installations classées relevant de la déclaration seront soumises à un contrôle technique obligatoire.

Ce contrôle technique, qui se met en place, sera réalisé par des organismes privés. Il sera à la charge financière des exploitants.

Les pouvoirs publics ont déjà confié divers contrôles techniques à des organismes privés dans le domaine de la construction, de la métrologie, de l'automobile, etc.

Ce contrôle visera à vérifier la conformité de l'entreprise à la réglementation et à informer l'exploitant. Il ne s'agit pas d'une délégation de pouvoir de l'Etat vers un organisme privé, mais avant tout d'une obligation d'information de l'exploitant.

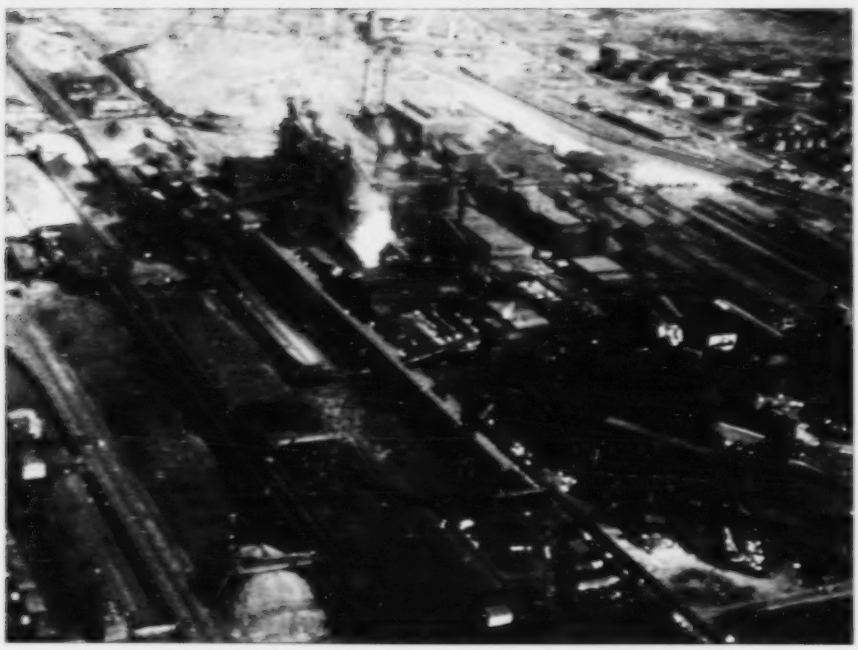
2.2.2. L'obligation d'information du vendeur à l'acheteur.

L'article 8.1 de la loi prévoit que tout vendeur d'un terrain où a été exploitée une installation classée soumise à autorisation doit en informer l'acheteur. Il appartient ensuite à l'acheteur d'exiger un audit de sol.

Cette disposition légale très simple est d'une grande efficacité puisque pratiquement elle met en place un système d'audit de sol lors des transactions sur les terrains industriels.

2.2.3. Les garanties financières

La loi va subordonner la mise en activité de certaines installations classées à l'existence de garanties financières : les garanties financières sont un moyen juridique de garantir financièrement la réalisation d'une obligation due par l'exploitant au profit de la collectivité, c'est-à-dire l'Etat.



Parmi les relais à la législation, il faut favoriser la prise en compte de la protection de l'environnement dans l'information financière des investisseurs et des actionnaires. Ici un site sidérurgique.

Ainsi une carrière de granulats ou un centre de stockage de déchets devront être couverts par des garanties financières pour leur remise en état en fin d'exploitation. Cela signifie qu'en cas de défaillance financière de l'exploitant, un tiers, le garant (qui sera un établissement de crédit) se substituera à l'exploitant pour assurer la remise en état.

2.3. Les relais à favoriser

Nous avons vu que les partenaires de l'entreprise et le public souhaitent de plus en plus être informés sur la politique de l'environnement des entreprises. Les partenaires de l'entreprise peuvent disposer de cette information par voie contractuelle. Mais l'entreprise peut également avoir intérêt de sa propre initiative à faire connaître sa situation.

L'Etat peut en outre donner une impulsion à cette information en développant certaines obligations (comme il l'a fait pour les ventes de terrain, cf. supra 2.2.2.). Ainsi, il pourrait instituer pour les grandes sociétés dont le capital est ouvert au public l'obligation de la prise en compte de la protection de l'environnement dans les documents comptables (notamment au niveau du bilan et de l'annexe). Cette information financière pourrait d'ailleurs être demandée par les actionnaires et par les investisseurs. Elle ne peut que favoriser le développement des entreprises "propres".

Par ailleurs, l'Etat doit être sensible à la lisibilité du droit de l'environnement.

Le public (les citoyens, les associations) doit voir son rôle développé en matière de protection de l'environnement. Mais c'est à lui d'acquérir les compétences que lui offrent les lois de protection de l'environnement. Car les textes juridiques actuels permettent de grandes possibilités d'actions contentieuses avec pour objectifs le respect de l'environnement et la réparation de dommages éventuels.

Ainsi le public informé (les éco-citoyens) peut devenir un relais efficace de l'action publique et jouer son rôle dans l'application du droit.

Le législateur a d'ailleurs montré son souci de faciliter l'action des associations de protection de l'environnement (loi du 2 février 1995 sur le renforcement de la protection de l'environnement) et l'administration souhaite rendre le droit de l'environnement plus lisible en le codifiant (la publication du code de l'environnement est prévue pour l'année 1996).

Conclusions

On connaît l'efficacité de l'action publique quant à l'élaboration des règlements techniques permettant la prévention des pollutions. On sait aussi ses limites quant à la vérification de leur respect.

Il existe des relais à cette action publique et les exemples que nous avons mentionnés peuvent être d'une grande efficacité.

Ces relais ne pourront que se développer dans les années à venir : en effet, les partenaires de l'entreprise et le public ont besoin de savoir s'ils ont affaire à une entreprise qui prend en compte ou non l'environnement. Et il faut que l'Etat profite de ce besoin afin de mieux faire respecter ses objectifs. ◆

Regulación ambiental e industria en México

Gabriel Quadri de la Torre, President, and Francisco Giner de los Rios, Director General, Instituto Nacional de Ecología, Secretaría de Medio Ambiente, Recursos Naturales y Pesca, Río Elba No. 20, 1er Piso, Mexico, D.F. 06500 Mexico

Resumen

En este artículo se presenta la evolución de los enfoques de la política ambiental hacia la industria en México, que parten de una perspectiva sanitarista para derivar, al cabo de 20 a_os, en una perspectiva de desarrollo sustentable. Se analizan los principales problemas ambientales generados por la industria en el país en materia de aguas residuales, atmósfera y generación de residuos. Finalmente se hace un recuento de las acciones de regulación y vigilancia llevados a cabo y se presentan los lineamientos del nuevo marco regulatorio.

Résumé

Cet article présente l'évolution des orientations de la politique environnementale vis-à-vis de l'industrie au Mexique, orientations qui partent d'une perspective sanitariste pour déboucher au bout de 20 ans, sur une approche de développement durable. On analyse les principaux problèmes environnementaux provoqués par l'industrie dans le pays en matière d'eaux résiduaires, d'atmosphère et de production de résidus. Enfin, on passe en revue les actions menées à bien dans les domaines de la réglementation et du contrôle, et l'on présente les grandes lignes du nouveau cadre réglementaire.

Abstract

This article describes the changing direction of environmental policy toward industry in Mexico, which has widened from health-oriented objectives to include, after twenty years, the concept of sustainable development. The article analyses the main environmental problems caused by industry in this country in terms of waste water, atmospheric emissions, and process residues. Finally, successful measures are reviewed in the areas of regulation and monitoring and the main characteristics of the new regulatory framework are described.

Introducción

La política ambiental mexicana tiene una historia de poco más de dos décadas. Desde 1971 a la fecha ha estado a cargo de las Secretarías de Salud, Desarrollo Urbano y Ecología, Desarrollo Social y de Medio Ambiente, Recursos Naturales y Pesca. Fue a partir de 1992 que se creó la actual estructura básica, conformada por un órgano normativo (el Instituto Nacional de Ecología) y otro, encargado de la vigilancia (la Procuraduría Federal de Protección al Ambiente). Es solo bajo la presente administración que se integra un órgano amplio encargado del Medio Ambiente. La Ley vigente es la General del Equilibrio Ecológico y Protección al Ambiente de 1988, de la que emanan una serie de reglamentos, normas y otros ordenamientos jurídicos.

La política ambiental ha evolucionado desde una orientación sanitarista hacia un enfoque más amplio de protección ambiental, para adoptar sólo recientemente un enfoque de sustentabilidad del desarrollo. La adopción de este enfoque obliga a analizar la regulación ambiental desde una óptica que combina éste ámbito de política con la política económica y social, y no sólo a la ley de sus efectos ambientales.

Esto obliga a diseñar la regulación ambiental en coordinación con la política industrial y a analizar sus múltiples sinergias y posibles contradicciones.

Se presenta a continuación un breve recuento de los impactos ambientales de la industria mexicana, centrada en la situación actual.

Después se analiza el desarrollo institucional, evaluando los instrumentos de regulación hacia la industria y finalmente se señalan los cambios que se están llevando a cabo, para indicar cómo se espera incrementar el cumplimiento y ligado a un objetivo de desarrollo industrial sustentable.

Principales pasivos ambientales de la industria

La industria contribuye a la generación de contaminantes de manera muy diversa, dependiendo de las características de los procesos y del tipo de insumos y productos. Algunas industrias afectan al ambiente fundamentalmente a través de sus descargas al agua, en tanto otras afectan la atmósfera, y otras más son generadoras importantes de residuos peligrosos o producen afectación al ambiente al emplear sustancias químicas.

No existe un inventario adecuado de contaminantes totales generados por el sector industrial, pero se ha procurado estimar la importancia de las diferentes industrias a través de métodos indirectos. Destacan entre los giros industriales que más afectan el ambiente la petroquímica básica, la química y las industrias metálicas, que en total parecen representar más de la mitad de la contaminación generada por el sector.

Emisiones contaminantes a la atmósfera.

Además de los polvos de proceso, las emisiones contaminantes a la atmósfera que tienen origen en la industria manufacturera adoptan la forma de partículas y gases producto de la combustión de energéticos fósiles, tales como el gas natural, diesel, gasóleo, combustóleo y gas LP.

La generación de contaminantes emitidos a la atmósfera por el sector industrial es variada, dependiendo de la rama industrial y de la composición del sector en cada región del país. Desde 1991 se han ido conformando los inventarios de las fuentes fijas de jurisdicción federal de las áreas prioritarias del país, que sirven de base para el presente análisis. Cabe resaltar que no se está tomando en cuenta la capacidad de carga ni las características de dilución y absorción de cada cuenca atmosférica, que es determinante de la importancia de la contaminación y la afectación a la salud y el ambiente.

Las emisiones de los contaminantes que se reportan en la mayoría de los casos son los derivados de los procesos de combustión y en las grandes empresas las emisiones de sus procesos. Estos contaminantes son las partículas suspendidas totales, el bióxido de azufre, el monóxido de carbono, los óxidos de nitrógeno y los hidrocarburos. Las zonas con mayor volumen de emisiones a la atmósfera son, en general, corredores industriales donde además hay una fuerte presencia de refinerías y/o plantas termoeléctricas. Se aprecia además una clara correlación entre la emisión de SO_x y PST y el volumen total de contaminantes emitidos en ellas, debido a la naturaleza del combustóleo empleado, que suele tener un alto contenido de azufre.

Por su importancia cualitativa y cuantitativa, así como por tratarse de la zona mejor estudiada del país, se hará un análisis de la contribución de la industria a las emisiones a la atmósfera de la Zona Metropolitana del Valle de México, que puede considerarse representativa del problema para la estructura industrial del país.

El inventario de emisiones de 1994 incluye 4623 empresas, que en su conjunto emiten 105,724 toneladas anuales, correspondiendo el 70.1% a las emisiones de SO_x, 24.5% a las emisiones de NO_x, 4.2% a las emisiones de HC, 1.4% a las emisiones de PST y 0.4% al CO.

Algunos de los rubros industriales con altas emisiones a la atmósfera vienen introduciendo nuevas tecnologías de combustión que permiten el reingreso de tales emisiones a los procesos de generación térmica. Es importante resaltar la

Emisiones industriales de contaminantes estimadas para 1994 (toneladas/año)

Ciudades	Muestra	PST	SO_2	CO	NOx	HC	Total
Total	6345	143024	1161231	203142	313060	145508	1965965
Tula-Vito-Apaxco	13	21503	339763	2787	66270	12540	442863
Manzanillo, Col.	11	18881	207045	2292	52296	414	280928
Toluca-Lerma, Edo. Mex.	67	13704	203170	2006	42779	1274	262933
Salamanca, Gto.	49	11391	117675	3565	21930	4073	158634
Tijuana, B.C.	114	3053	11749	117552	6032	231	138617
Coatzacoalcos-Minatitlán	78	9944	5818	25053	35125	58479	134419
Tampico-Altamira	14	5876	66323	824	8876	30660	112559
ZMCM	4623	6358	26051	8693	31520	33099	105721
Torreón, Coah.	94	4585	59092	8052	639	178	72546
Monterrey, N.L.	85	9724	22360	2164	8375	115	42738
La Paz, B.C.S.	25	3038	31128	267	6007	45	40485
Mérida, Yuc.	42	2497	28932	1057	7806	79	40371
Cd. Juárez, Chih.	135	4968	5751	17199	9160	1195	38273
Guadalajara, Jal.	423	15045	10634	1624	3184	49	30536
Otras Ciudades	572	12457	25740	10007	13061	3077	64342

Fuente: INE, Programa Regional de Administración de la Calidad del Aire en Zonas Prioritarias, 1994

enorme concentración de las emisiones a la atmósfera dentro del sector industrial. Tan sólo 94 empresas ubicadas en la ZMCM emiten cerca del 70% de los contaminantes totales del sector a la atmósfera, y esta proporción crece aún más en el caso de NOx e hidrocarburos, donde la participación de este conjunto de empresas llega a representar el 83% de las emisiones totales.

Conviene señalar que la instalación de equipos para prevenir y controlar emisiones es limitada. De 4623 industrias inventariadas en la Zona Metropolitana del Valle de México sólo el 13.6% reporta la existencia de equipos de control en sus procesos, de los cuales el 11.3% corresponde al control de partículas, el 1% corresponde al control de hidrocarburos, y el 1.3% al control de bióxido de azufre.

Descargas de aguas residuales industriales

El agua es un elemento importante para la industria. Se utiliza directamente en el proceso productivo como solvente o mezcla, o de manera indirecta en los lavados y procesos de enfriamiento.

A escala nacional, excluyendo la generación de electricidad, la industria consumió en 1994 aproximadamente 3,200 millones de metros cúbicos de agua. Aproximadamente 8% del consumo total nacional. Esta distribución del consumo varía significativamente entre regiones y entre zonas urbanas y rurales.

En comparación, las descargas de aguas residuales industriales son aproximadamente 1,800 millones de metros cúbicos. Si bien se carece de información precisa al respecto, las aguas residuales de origen industrial son una proporción relativamente baja de las aguas residuales del país, particularmente si las comparamos con la participación del sector en el PIB, que es de cerca del 30%. No todos los sectores industriales participan de la misma manera en la generación de aguas residuales, tanto por la naturaleza de sus procesos como por la intensidad de evaporación y reuso. Así, un sólo sector industrial, el de los ingenios azucareros, representa un 40% de dichas descargas y le sigue en importancia el correspondiente a la industria química con un 18%.

Sin embargo, en términos de carga orgánica total la industria genera 4,900 toneladas por día, siendo la industria más contaminante la del azúcar, con un 53%, la fabricación de bebidas y la fabricación de alcohol, con una participación de 10% cada una seguidas de la industria alimenticia, metálica básica y química, que aportan cada una alrededor de un 5% de la carga orgánica.

Lo anterior coloca en una dimensión adecuada el problema cuantitativo de las descargas industriales. Sin embargo, es importante hacer notar que la composición de las descargas, y otros parámetros físicos, tales como su temperatura, son diferentes a la de las descargas de otros sectores. Dependiendo del giro industrial es posible encontrar metales pesados, grasas y aceites, sales, ácidos e incluso residuos tóxicos disueltos en proporciones elevadas. Se ha hecho un esfuerzo para reducir, a través de plantas de tratamiento, una parte significativa de las descargas.

Las descargas de la industria de alimentos, por la naturaleza de sus procesos, tienen en general proporciones altísimas de demanda biológica de oxígeno que requieren para su remoción de tratamientos avanzados. Otras actividades, tales como la curtiduría y la galvanoplastia, generan descargas con alta proporción de tóxicos y metales pesados, difíciles de controlar por la dispersión de generadores.

De esta manera, el pasivo ambiental de la industria en materia de aguas residuales es significativo, no tanto por su monto absoluto como por la composición de sus descargas.

Generación de residuos peligrosos

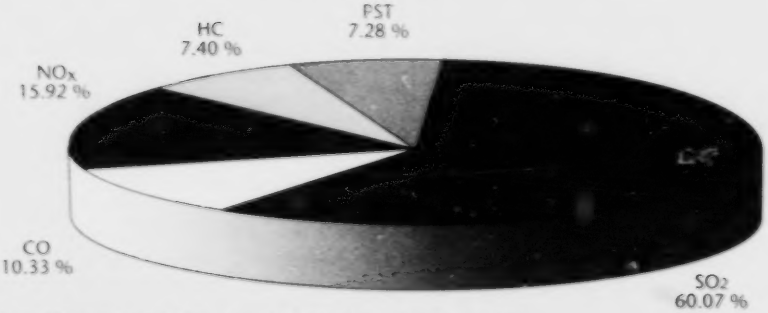
Para el manejo integral de residuos peligrosos es de vital importancia contar con un inventario de generación. A pesar de que se cuenta con algunos estudios de afectación ocasionada por residuos peligrosos de la industria maquiladora y estudios de impacto ambiental asociados a diversas actividades y proyectos de manejo, aún no se dispone de un banco de información o sistema actualizado en la materia. A diferencia de las emisiones industriales a la atmósfera que se encuentran muy concentradas en grandes industrias de ciertas ramas, en materia de residuos peligrosos se carece todavía de información que aclare la participación relativa de la micro, pequeña y mediana industria en términos de diferentes tipos de residuos.

Es posible que la generación total de residuos peligrosos en México ascienda a un volumen agregado de entre tres y siete millones de toneladas anuales. Por su parte, la infraestructura y los sistemas de manejo en operación son sumamente precarios.

Dada la desproporción que guarda el volumen creciente de residuos peligrosos generados con las capacidades existentes de manejo, vigilancia y control, con frecuencia se observa una disposición clandestina.

La infraestructura existente en México para el manejo de residuos peligrosos es muy limitada, insuficiente para procesar los varios millones de toneladas que genera cada año la industria. Las razones de este rezago radican en parte en el tiempo corto de maduración que ha tenido la política ambiental, así como en la carencia de actividades de promoción industrial y en la falta de mecanismos imaginativos de financiamiento. También ha influido en esta limitación la existencia de una opo-

Figura 1
Porcentaje de emisiones por contaminante



Fuente: INE, Programa Regional de Administración de la Calidad del Aire en Zonas Prioritarias, 1994

sición sistemática de parte de comunidades locales al establecimiento de infraestructura para el manejo de residuos peligrosos. Algunas estimaciones permiten concluir que tal vez sólo alrededor de 10% del total de residuos peligrosos generados en México recibe un manejo adecuado a través de los sistemas y de la infraestructura instalada.

Riesgo ambiental y sustancias químicas

Aunados a los problemas locales o regionales que puede ocasionar la contaminación química del ambiente, se encuentran otros de carácter global como son la destrucción de la capa de ozono que protege al planeta de las radiaciones ultravioleta del sol, provocada por las emisiones de clorofluorocarbonos y otras sustancias.

El almacenamiento de cantidades elevadas de sustancias peligrosas en empresas situadas en parques industriales o en zonas densamente pobladas, incrementan a su vez los riesgos de accidentes y de impactos severos en la población, los bienes y los ecosistemas.

A lo anterior se suman los riesgos de incidentes en el transporte o de fugas e incendios en instalaciones industriales. Aunque no existe en la actualidad un sistema de registro de este tipo de eventos, en el período 1990-1993, se registraron 370 incidentes que involucraron sustancias químicas, de los cuales el 70% ocurrieron en el interior de empresas.

Otro indicador de los riesgos que conlleva el manejo de las sustancias químicas tóxicas, son los casos de intoxicación o enfermedades derivadas de la exposición a ellas en el ambiente laboral. De manera similar, sucesos de muerte de gran número de aves o peces, señalan que se rebasan límites de tolerancia a la exposición a contaminantes químicos.

El establecimiento de programas de prevención de accidentes y de atención a emergencias internas y externas en las actividades de alto riesgo, se ha visto acompañado de programas proactivos de información a las comunidades vecinas acerca de las sustancias peligrosas que pueden ser emitidas en caso de accidente y de los comportamientos a seguir para prevenir riesgos.

Marco regulatorio y avances en verificación

Las prescripciones básicas de la ley se especifican en Normas Oficiales Mexicanas, que son tomadas por la sociedad como la principal guía de política ambiental. En la actualidad hay 85 Normas Oficiales Mexicanas publicadas, 11 cuyos proyectos están en espera de ser publicados en el Diario Oficial de la Federación, 7 proyectos sujetos al procedimiento de consulta pública, y 35 anteproyectos de normas oficiales en discusión en grupos de trabajo.

La presentación de manifestaciones de impacto ambiental se ha consolidado como un mecanismo preventivo. Es ya un procedimiento ineludible para los proyectos más relevantes por sus implicaciones ambientales. Anualmente ingresan centenares de manifestaciones que requieren una evaluación federal, lo que no ha sido obstáculo para que el rezago que inicialmente se generó haya ido disminuyendo. Hasta septiembre de 1995 habían ingresado un total de 5,440 proyectos, de los cuales cerca de 600 se incorporaron a lo largo de 1995.

Contribución porcentual por tipo de contaminantes 1994

Sector	PST	SO2	CO	NOx	HC	Total
Generación de Energía Eléctrica	2.56	0.07	14.9	57.1	0.29	18.37
Refinación de Petróleo/Petroquímicas	0.11	0.33	0.05	0.09	0.48	0.27
Industria Química	15.31	13.22	29.9	7.63	21.8	15.79
Minerales Metálicos	8.65	2.39	16.8	1.77	1.39	3.45
Minerales No Metálicos	26.35	44.95	3.72	15.5	9.57	20.63
Productos Vegetales y Animales	1.75	3.23	0.46	0.83	0.72	1.41
Madera y Derivados	6.05	15.02	5.33	5.73	4.36	7.59
Productos de Consumo Alimenticio	12.57	8.1	4.67	3.36	1.2	4.5
Industria del Vestido	7.23	9.23	8.44	3.45	1.83	5.01
Productos de Consumo (Varios)	1.05	0.42	0.85	2.17	0.92	1.16
Productos de Impresión	12.2	0.07	0.17	0.04	15.2	5.52
Productos Metálicos	3.1	2.15	7.51	1.5	4.68	3.24
Productos de Consumo No Durable	1.56	0.15	1.16	0.22	1.81	0.86
Productos de Consumo Durable	1.47	0.66	6.02	0.63	8.94	3.73
Artes Gráficas	0	0	0	0	26.6	8.31
Otros	0.04	0.02	0.09	0.01	0.37	0.13
Total	100	100	100	100	100	100

Fuentes: Instituto Nacional de Ecología, Sistema Nacional de Información de Fuentes Fijas, 1994, y Departamento del Distrito Federal, Dirección General de Ecología, Subdirección de Inventario de Emisiones y Atención a Contingencias, 1994

En el plano del proceso de licenciamiento industrial en materia de atmósfera se han otorgado un total de 7453 licencias hasta septiembre de 1995, de las cuales 4905 (65.8%) corresponden a la Zona Metropolitana del Valle de México (ZMVM) y 2548 al resto del país.

En la materia de residuos peligrosos, destacan la regulación del movimiento transfronterizo a través de guías ecológicas que permiten el traslado, importación o exportación de residuos que están bajo este régimen, las autorizaciones de importación y exportación expresas y casos recientes en los cuales se ha autorizado la exportación de Bifenilos Policlorados para su incineración en Europa.

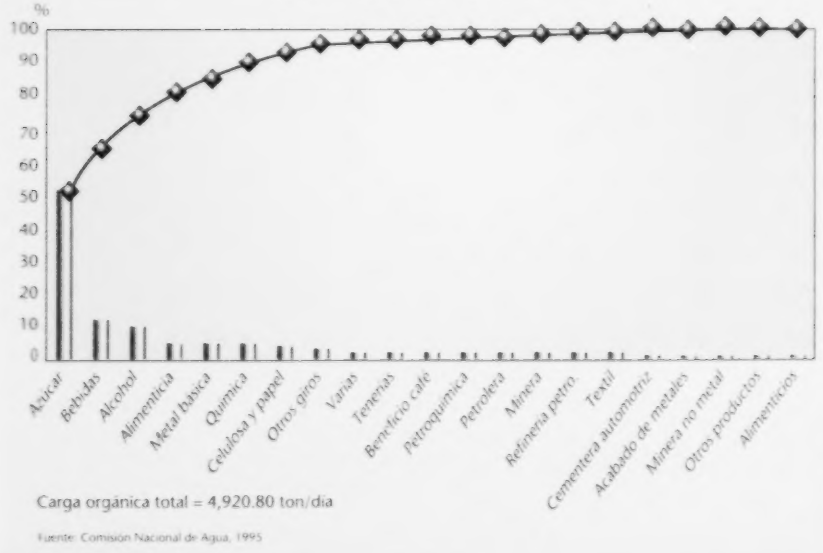
En materia de estudios de riesgo, se han presentado al 31 de octubre de 1995 un total de 1,715. En lo referente a los programas de Prevención de accidentes, al 31 de octubre se habían recibido 198 solicitudes de aprobación de programas.

Avances en la verificación ambiental

Bajo los principios establecidos en el objetivo de verificar el cumplimiento de la normatividad ambiental, se han diseñado y puesto en práctica programas de revisión de las fuentes de contaminación de competencia federal, que se realizan de manera prioritaria a las empresas con un mayor

Figura 2
Carga orgánica por giro industrial

Porciento generado y acumulado



Carga orgánica total = 4,920.80 ton/día

Fuente: Comisión Nacional de Agua, 1995

potencial contaminante, dando especial atención a las quejas y denuncias realizadas por la comunidad.

En el programa de *Inspección y Vigilancia de las Fuentes de Contaminación Industrial*, en el lapso de junio de 1992 a octubre de 1995, se efectuaron aproximadamente 44,000 visitas a fin de verificar el cumplimiento de la ley por parte de las empresas, lo que implicó, en su caso, la clausura parcial o total de empresas y la aplicación de sanciones económicas.

No. de visitas de inspección a industrias 1992-1995

	1992	1993	1994	1995*	Total
Clausura total temporal	107	132	83	64	386
Clausura parcial temporal	809	550	302	188	1849
Irregularidades leves	995	12,115	10,161	7,516	30787
Sin irregularidades	3,074	1,590	2,187	3,896	10747
Visitas de inspección a industrias	4,985	14,387	12,733	11,664	43769

Fuente: PROFEPA, Subprocuraduría de Verificación Normativa.
*Nota: El dato de 1995 corresponde hasta el 31 de octubre.

Asimismo, en la realización de estas visitas se detectaron aproximadamente 52,400 toneladas de residuos peligrosos dispuestos en tiraderos clandestinos, se logró identificar a las empresas infractoras y estas fueron sancionadas conforme a la Ley. Dentro del proceso de remediación de sitios contaminados se observa que, de finales de 1994 al 31 de octubre de 1995, algunas de las empresas infraccionadas realizaron labores de remoción y confinamiento de los residuos, estimándose el retiro de 12,500 toneladas, que han sido depositadas en sitios de confinamiento controlado.

En particular, durante el invierno de 1994-1995 y la primavera-otoño de este último año, se declararon 5 contingencias ambientales en la Zona Metropolitana de la Ciudad de México, que sumaron un total de 12 días. Para atender dichas contingencias, operaron en promedio 30 brigadas que realizaron 1,537 visitas para verificar los niveles de operación de las empresas comprometidas con el Programa, cuyos resultados fueron: 895 empresas en cumplimiento, 454 fuera de operación, 99 incumplieron, y se realizaron 88 reverificaciones y una reubicación. En ese mismo período, se detuvieron 20,776 vehículos ostensiblemente contaminantes, y se sancionaron 11,785 de ellos.

Como complemento a los programas de invierno, se opera el Programa de *Vigilancia Aérea*, el cual consiste en la identificación sistemática de las industrias con emisiones ostensibles a la atmósfera, en las cuales participan autoridades de la federación, del Departamento del Distrito Federal y del Estado de México. Asimismo, a través de este Programa, también se atendieron denuncias presentadas por los medios de comunicación que operan helicópteros en la Zona Metropolitana de la Ciudad de México. Durante el invierno de 1994-1995 se identificaron 146 industrias con emisiones ostensibles, las cuales subsecuentemente fueron visitadas por inspectores, obteniéndose los siguientes resultados: 32 empresas sin irregularidades, 106 con irregularidades leves y 8 con clausura parcial. Estos resultados muestran una reducción de aproximadamente un 5 %, en el número de establecimientos detectados como ostensiblemente contaminantes con respecto al invierno 1993-1994.

Dentro del marco del programa de auditoría ambientales, durante el período junio de 1992 a octubre de 1995, se iniciaron 555 auditorías a empresas y establecimientos industriales. Del volumen total de auditorías, se concertaron 127 convenios de cumplimiento que, a la fecha, han representado una inversión por parte de los responsables, de 1,179 millones de nuevos pesos.

Por otra parte, opera la Comisión Intersecretarial para el Control del Proceso y Uso de Plaguicidas, Fertilizantes y Sustancias Tóxicas, en cuyo marco se analizan las autorizaciones, permisos y uso de estos productos.

La operación del Sistema Nacional de Atención a la Denuncia Popular, se coordina con las instancias federal, estatal y municipal, para proporcionar un servicio más ágil y funcional a la ciudadanía. Asimismo, se intensificó la conciliación y resolución de querellas entre particulares.

Auditorías ambientales

	1992	1993	1994	1995	Total
Auditorías iniciadas	77	122	238	118	555
Auditorías concluidas	19	66	160	105	350
Invalidadas		3	9	3	15

Fuente: PROFEPA, Subprocuraduría de Auditoría Ambiental. Nota: Para 1995 el dato es hasta el 31 de octubre.

La Procuraduría Federal de Protección del Ambiente, ha atendido un total de 16,041 denuncias a nivel nacional. De los hechos, actos y omisiones denunciados en 1995, 1,576 se relacionan con contaminación del aire, equivalente al 42.9% del total; 458 con el agua (12.4%); 613 con el suelo (16.7%); 536 con la flora (14.6%); 335 con la fauna (9.1%); y 159 con diversas solicitudes o sugerencias (4.3%). De igual forma, se atendieron 116 expedientes de denuncias o quejas promovidas por la H. Comisión Nacional de Derechos Humanos.

En materia de descentralización, SEMARNAP cuenta con Delegaciones en cada una de las entidades federativas del país, mismas que de manera autónoma y sólo con las directrices del Sector Central, atienden los diferentes problemas ambientales de carácter federal. Asimismo, la PROFEPA, cuenta con delegaciones estatales encargadas de la vigilancia y promoción de la aplicación de la normatividad ambiental. Los gobiernos locales tienen atribuciones para atender problemas ambientales que se están ampliando, en particular, con respecto al control de la contaminación del aire.

Denuncias recibidas

Año	1992	1993	1994	1995
Número de denuncias	1317	6174	4870	3860

Fuente: PROFEPA, Coordinación de Delegaciones.

Tendencias recientes de la política ambiental hacia la industria

Los instrumentos existentes han sido empleados fundamentalmente con un fin de control, y han estado muy centrados en la necesidad de verificación. Hace ya más de una década que existen normas ambientales, pero como se ha visto, el grado de cumplimiento es menor que el deseable, si bien se ha avanzado en el control adecuado de las principales fuentes de contaminación.

Se está procurando un cambio en el diseño de la regulación ambiental que consiste en un nuevo diseño de normas, su complementación con un proceso de licenciamiento directo con un enfoque multimedio y la introducción paulatina de instrumentos económicos. A la vez, se están fomentando las acciones de autorregulación industrial de manera decidida.

Se está buscando generar una normatividad "de piso", que limita la contaminación "al final del tubo", pero que sea gradual, para permitir cambios en proceso en lugar de inducir controles que no siempre se llevan a cabo, allí donde sea conveniente. Adicionalmente, se busca que las normas discriminen límites de acuerdo a la capacidad de carga de los ecosistemas, y no a las características tecnológicas de las industrias. Se busca una coordinación entre diferentes medios, para evitar la transferencia de contaminantes entre ellos y aprovechar el carácter inductor de cambio tecnológico inherente a la normatividad.

Esta normatividad "de piso" se complementa con un proceso de licenciamiento directo, que se está rediseñando para hacerlo más eficiente, a la vez que minimice la carga burocrática, y con el diseño de instrumentos económicos específicos para industrias que generan residuos sujetos a reuso o reciclaje, con el fin de establecer las condiciones para un adecuado aprovechamiento y valorización de los mismos. Adicionalmente, se contempla la creación de mercados de derechos de emisión a la atmósfera y de descargas al agua.

En el plano de la autorregulación se pretende ampliar y profundizar el sistema de auditorías voluntarias entre las empresas y la autoridad, desarrollar convenios específicos con industrias particulares, impulsar la normatividad voluntaria y desarrollar procesos de certificación.

Todo ello habrá de conducir a una mejor coordinación entre la política ambiental y la política industrial, buscando con ello sentar las bases de un desarrollo industrial sustentable. ◆

UNEP'S environmental law activities and industry compliance

Marceil Yeater, Legal Officer, UNEP's Environmental Law and Institutions Programme Activity Centre (ELI/PAC)

The Environmental Law and Institutions Programme Activity Centre (ELI/PAC) of the United Nations Environment Programme (UNEP) works towards the development of international instruments, as well as national capacity, in the field of environmental law. ELI/PAC further seeks to ensure countries' compliance with and implementation of applicable environmental legal provisions. To this end, a number of ELI/PAC's efforts at the global, regional and national levels seek to improve industry compliance with binding and non-binding environmental standards and procedures.

Some of ELI/PAC's relevant activities are described below. In the coming years, ELI/PAC intends to place even more emphasis on its commitment to helping governments enhance industry compliance.

Global level activities

The general subject of industrial compliance and enforcement received substantial attention at the Second UNEP/UNITAR/ UNCHS Global Training Course on Environmental Law and Policy (Nairobi, 27 March-13 April 1995) and constitutes a primary chapter in UNEP's soon-to-be-published Training Manual on Environmental Law. ELI/PAC is also planning publications in 1996-97 on 1) national legislative texts from developing countries which implement selected environmental conventions, 2) successful national efforts to promote or compel compliance with environmental legislation, and 3) judicial decisions which interpret and apply such legislation.

Industry compliance has long been an issue within UNEP's work related to the environmentally sound management of chemicals and wastes. Chemical manufacturing and related industries have regularly been invited as observers to UNEP meetings on the development and implementation of the London Guidelines for the Exchange of Information on Chemicals in International Trade (1987, amended 1989). A major element of the London Guidelines, the principle of prior informed consent (PIC), is now scheduled to become the basis of a new international legally binding instrument.

The PIC principle provides that chemicals which have been domestically banned or severely restricted for health or environmental reasons shall not be exported to countries without their prior consent or agreement. Under the current voluntary PIC procedure, obligations for reporting and disseminating the import control decisions of importing countries (i.e. to permit or prohibit the entry of certain hazardous chemicals) are designed to improve the export industry's compliance with those decisions.

During 1992-94, ELI/PAC provided a forum in which private sector parties came together and agreed on a Code of Ethics on the International Trade in Chemicals. The Code complements non-binding government obligations under the London Guidelines. Based substantially on voluntary industry initiatives such as "Responsible Care" and "Product Stewardship", the Code provides principles and guidance for enhancing chemical safety. After translation into the six UN languages, the Code has been disseminated widely to about 170 industry associations worldwide, including those in developing countries. This should facilitate the adoption of safe chemical management practices by industries which may not have had access to such information in the past. By the end of 1995, a number of industry associations had communicated to UNEP their intention to comply with the Code. UNEP's report on the status of industry compliance with the Code now is being prepared.

Regional level activities

In late 1994, UNEP Industry and Environment (UNEP IE), UNEP's Regional Office for Asia and the Pacific, and ELI/PAC organized a Regional Workshop on Institutional Capacity Building for Industrial Environmental Compliance and Enforcement Response in Rapidly Advancing Economies in Asia (Beijing/Beihai, 13-19 November 1994). The workshop considered the development of enforcement programmes, regulatory/permit systems, compliance monitoring (including audits and self-monitoring), inspection schemes, cooperation among government agencies, and the awareness and involvement of industry regarding compliance issues and financial resources to implement compliance programmes. ELI/PAC has been working on follow-up activities in selected Asian countries to develop relevant legislation (e.g. prevention of industrial pollution).

During June 1995 ELI/PAC, together with the UN Economic Commission for Europe and the host government of Sweden, convened a regional meeting on the application of environmental norms by military activities. Many of the issues discussed had ramifications for the defense and other military-related industries. Additional regional meetings are planned for Asia, Africa, Latin America/the Caribbean, and West Asia in 1996-97.

In late 1995, ELI/PAC contributed to the UNEP Workshop on Cleaner and Safer Industrial Production for Eastern and Southern African Countries (Nairobi, 21-24 November 1995). During its presentations, ELI/PAC noted that industry is likely to be affected by national environmental laws on: environmental impact assessment or other development planning; management of mineral, forest, fishing and other natural resources; prevention of air, soil or water pollution by chemicals and wastes; emergency prevention/management; occupational safety and health; classification of dangerous industrial installations; and access to environmental information. With regard to environmental conventions of particular relevance to industry, ELI/PAC discussed the industrial implications of international agreements on the ozone layer, hazardous wastes, climate change, biological diversity, and trade in certain hazardous chemicals.

National level activities

In the context of providing technical assistance requested by governments, ELI/PAC has worked with individual countries since 1973 to establish effective national environmental legislation and institutions. Virtually all of these legal capacity-building projects have implications for industry, and many of them benefit from industry participation. This reflects the realization that sound environmental management occurs through a partnership of government, industry and the public. Such cross-sectoral involvement helps ensure the development of national legislation which meets locally-agreed needs, has the support of affected parties, and can be implemented with available resources.

Historically, ELI/PAC's assistance to countries in developing framework and sectorial legislation resulted in traditional "command and control" provisions for compelling compliance. In recent years, ELI/PAC has promoted the use of economic instruments, training/education, public access to environmental information, and research/development as means of encouraging compliance. ELI/PAC is committed to continuing these efforts in order to help countries find an effective balance of incentives and disincentives for industry compliance with environmental regulation.

Conclusion

With UNEP's increased emphasis on the implementation of existing environmental law at the international and national levels, ELI/PAC expects its activities related to industry compliance to grow. These activities are also likely to involve ELI/PAC in new or strengthened partnerships with government agencies, Convention Secretariats, industry associations, and non-governmental organizations. ELI/PAC looks forward to exploring with others more effective means of ensuring that environmental law is not merely a "paper tiger."

South Africa: a state of change

Jonathan Hobbs and Karin Ireton, Industrial Environmental Forum of Southern Africa, D2X35, P.O. Box 1091, Johannesburg 2000, South Africa

Abstract

South Africa's transition to democracy is providing the opportunity for a complete review of its environmental legislation, policies and institutions. If the reappraisal process now underway is successful, not only will environmental protection measures be improved, but this process may also serve as a model for other countries.

Résumé

Le nouveau régime démocratique qui se met en place en Afrique du Sud fournit l'occasion de revoir complètement les lois, politiques et institutions qui régissent la protection de l'environnement. Si le processus d'évaluation actuellement en cours est couronné de succès, non seulement les mesures de protection de l'environnment seront améliorées, mais l'exercice pourrait également servir de modèle à d'autres pays.

Resumen

La transición democrática en Sudafrica proveé una revisión completa de legislación ambiental, normas e instituciones. Si este proceso el cual está ya en marcha es un éxito, no solamente serán mejoradas las medidas de protección ambiental, sino que servirá de modelo para otros países.

South Africa underwent a political rebirth in 1994, when for the first time all citizens could participate in free and open elections. In the two years leading up to the election of President Nelson Mandela and the ANC-led government of national unity, and the two years since, there has been a major push to renegotiate national policies and institutions. Before the election, the task was to put in place a bill of rights and an interim constitution. Since then, the time has been spent re-evaluating policies, programmes and legislation and finalizing the constitution.

Entrenched in the interim constitution, which was the product of multi-party negotiations before the 1994 elections, is the right of individuals to an environment not detrimental to their health and well-being. An extensive campaign to seek public submissions on the constitution was held. The Constitutional Assembly is now evaluating and assimilating the many thousands of inputs on all aspects of the constitution, and the final document is expected to be published in mid 1996. Some significant proposals pertaining to environmental rights have been made, including phrasing the environmental rights in a positive sense to give them the strength in law of other human rights, adding individual duties and responsibilities towards the environment, ensuring inter-generational equity in the consumption or use of environmental resources, and stating the State's duties towards the environment.

Incorporating environmental rights into a national constitution is not a new idea. Some 54 countries have done so thus far, although only three in Africa to date, according to C.O. Okidi1 of UNEP. It is, however, an opportunity that rarely presents itself. The characteristics of the environmental clauses incorporated into national constitutions vary considerably. They range from added-on clauses, to comprehensive details and fundamental rights, to statements of public policy.

At the same time as the constitutional negotiations have been going on, virtually every tier and department of government has been undergoing significant change, both in structure and in the way they conduct their business, as well as in the instruments of policy, legislation and regulation they use.

Environmental legislation in South Africa has existed for many years and has steadily increased. However, as the laws were the products of the former government and developed in the era before public participation was considered an essential component of policy formulation, they lacked credibility in the eyes of the majority of the population. Historically, the Department of Environment Affairs has also been considered something of a Cinderella ministry. Environmental issues were politically subservient to other issues, except to some extent in the field of nature conservation and national parks. The DEAT was unable to prevent politically dictated poor land use planning, or steps taken to underpin the fragile economy during the years of political unrest and disinvestment. The DEAT was also hampered by severe shortages of manpower and funds. An environmental policy negotiation process was launched in August 1995 at a national conference which included 500 representatives of stakeholder groups. This process goes by the acronym CONNEPP (Consultative National Environmental Policy Process). The hope is that before the end of 1996 a white paper will be published so that the new policy, and probably also legislation, can be published during 1997. The process has been dogged by controversy, reflecting some of the lack of trust which exists between key stakeholder groups.

A draft green paper, an instrument which sets out policy options, is currently being tested on a small reference group prior to circulation through the provinces and key sectors for broader comment. It tries to place in context the need for policy, the various principles on which future policy could be based, and the types of policy instruments and approaches available. Options regarding the type of institutions needed for environmental management at State level are also being put forward.

Environmental issues in South Africa are dealt with by a number of government departments, which is believed to be a significant weakness in terms of effectively managing environmental protection. Some proposals regarding a reallocation of responsibilities are being mooted along with the new national policy.

Past approaches

Environmental responsibility associated with mining activities, for example, have been managed by the Department of Mineral and Energy Affairs. Although environmental responsibilities have been part of mining legislation since the early 1980s, this legislation has focused on rehabilitation aspects. Since 1993, any new mining projects have been legally required to undertake environmental impact assessments and produce Environmental Management Programme Reports. This requirement was a result of the Minerals Act, which came into effect on 1 January 1992 and a subsequent *aide mémoire*. These EMPRs become legally binding documents which commit to rehabilitation and mitigatory measures. The system is criticized by some as not requiring sufficient public participation. However, this is currently the only area where environmental impact assessments are mandatory. Regulations are also being drafted under the existing Environmental Conservation Act (Act No 73 of 1989) that schedules activities for which EIAs will be required.

Similarly, water issues are managed by the Department of Water Affairs and Forestry. Because of their responsibility for groundwater, waste management falls under their jurisdiction as well. New minimum standards for landfill sites were published last year. Although they had been significantly discussed by government, waste generators and the waste management industry, the NGO community was critical of them as they

felt they had not been sufficiently involved in that formulation. At present, waste management companies are operating to these minimum standards for new sites as though they were legally binding. However, this is a relatively new development and there are many established sites which do not meet the new standards. A programme is in place requiring landfill operators to licence their sites and meet appropriate standards.

Until fairly recently, air pollution was under the Department of Health. Scheduled processes are governed by individual permits and permit holders were required to report regularly to the Chief Air Pollution Control Officer. That office also approved new permit applications. However, since the inception of this Act the Department has been understaffed and has never had more than six air pollution control officers for the whole country. As a relic of the anti-apartheid sanctions era, publication of emissions details have been prohibited under various security legislation on the basis that extrapolations could be made back to input materials and processes, possibly placing key suppliers at risk. With the new commitment to transparency, it is likely that all reporting under such legislation will be public information.

Local air pollution issues, such as the suburban smokeless zones programmes, were dealt with in the past at the municipal level in the formerly white suburbs. In the black townships, themselves the product of apartheid legislation, few homes were electrified. Such legislation was therefore non-existent. Some of the most severe air pollution problems in South Africa, and the attendant health problems, can be traced back to poor people cooking and heating their homes with fossil fuels burnt in open fires.

Until now, control measures have been almost exclusively traditional command-and-control type. As in many other developing countries, these measures were not particularly effective as the disincentives and penalties were not severe and there was only a limited ability to enforce them. Industry adopted a reactive attitude. In recent years this has changed, but it has had little to do with legislation. Trade pressures, investment, and more frequent exposure to international norms resulting from the end of South Africa's isolation has stimulated change.

Under the Atmospheric Pollution Prevention Act (No. 45 of 1965) permits have been issued for scheduled processes on a case-by-case basis. Permit holders have been required to report regularly, especially on particulate emissions. However, the Chief Air Pollution Control Officer's ability to enforce those provisions has been limited. Although he has the authority to shut down a process if it regularly exceeds the conditions of the permit, this option is not known to have been used. A number of years ago the electricity generator, Eskom, renegotiated one of its permits to enable it to test fabric filters on two units at its 3600 megawatt Duvha power station. The units have now been withdrawn from supply due to failure of the filters. The failure has been attributed to the quality of the coal burnt in a South African power station, which is very low in calorific value, very high in ash content, and exceptionally abrasive. In other instances, permission has been obtained to exceed the permit requirements for limited periods until improvements could be implemented. Monitoring of gaseous emissions is rare in South Africa. Some programmes are currently underway to improve capability in this area, but it is generally agreed that neither the government nor the private sector can accurately state the pollutants being emitted. A network of monitors evaluating ambient air quality does, however, exist with the inherent problems of tracing emissions back to source.

In 1992, an Integrated Pollution Control programme was launched to review present government functions and structures concerned with pollution control procedures from a functional distribution, permitting and enforcement viewpoint. Waste management has recently been added to the brief. Although the work of this project continues, it is to some extent treading water until the national umbrella policy process makes some progress. A white paper is planned detailing a revised system. The goal is to initiate a process of restructuring the regulatory system to produce a more effective, integrated national framework for integrated pollution control. The project is run in collaboration with the nine provincial governments, as well as the various national government departments. The national policy, although launched after the IPC project, will provide the guiding principles, national goals and consensus on priorities. The existing air pollution approach of best practical means may well be replaced by best available technology not entailing excessive cost, or best practical environmental option. Also critical to the IPC debate is the question of institutional change and any changes in legislation which might flow out of the policy process. As with all current initiatives, extensive consultations with all major stakeholders are critical to its success. An efficient integrated pollution control system will provide for a distribution of functions between three tiers of government that optimizes resource deployment and reduces duplication, overlapping mandates, and conflicts. The IPC system must thus be reduced to its logical components before the distribution of duties takes place. Water pollution control, for example, is recognized as an integral part of quality management which, in turn, is best integrated at catchment level. But it depends on effective control at sources of pollution, which is best achieved at a regional level.

New structures

The development of provincial government systems needs to proceed parallel to the development of a national system (which provides a framework ensuring regional consistency). The interim constitution devolved the responsibility for environmental legislation to the nine provincial governments. However, there is still a great deal of confusion and uncertainty over this issue. While the principle of governance closest to the people is generally welcomed, there are serious concerns about the ability of the provincial governments to set and implement legislation. On the part of national businesses, there is also a real fear of the cost implications of having different standards in all provinces.

Until recently, the environmental responsibilities of provincial governments were focused around nature conservation. They are ill-equipped (from a human, financial and technological point of view) to deal with wider environmental issues. A number of capacity-building programmes are about to be launched, with the assistance of foreign aid agencies, but it will be some time before the results are seen. Each province and local authority has its own set of circumstances, issues and concerns.

The debate has not yet ended about whether environmental issues should be controlled by a central super ministry or enforcement agency, or left to the provinces to manage, or whether less drastic changes will suffice.

Current revisions

A number of different laws and policies are currently under revision by the various ministries. Many of them will impact on and be affected by new environmental policy and legislation. Examples include the Water Act, the aforementioned introduction of mandatory environmental impact assessments, new legislation governing hazardous waste management, and the changes required for the ratification of various environmental conventions and treaties.

A review of water law has recently been completed. One recommendation is that pricing should reflect true costs. Water prices in South Africa are low by comparison to those in developed countries, despite the fact that water is probably South Africa's most limited resource. There are also vast areas of the country where there is no appropriate supply infrastructure. One Department of Water Affairs and Forestry programme underway aims to ensure that all citizens have access at no cost to an amount of 25 litres per day. It is anticipated that marginal water use tariffs will be brought in, with water prices rising significantly over the coming decades as the price is raised to cover costs of supply. In South Africa, with its ill-matched patterns of water distribution and demand, the costs of supply are significant. A number of river courses are being reversed to accommodate agricultural, electricity generation and industrial demands.

A zero effluent policy is also likely to be imposed on all major industry. Although some significant industrial recycling programmes are currently underway, they need to be expanded to include small and medium-sized enterprises.

Hazardous waste management reached a crisis at the end of the 1995 with the closing of one of only two hazardous waste sites in the Gauteng province, the centre of industrial activity in the country. The site had reached maximum capacity, but its closure has compromized industry and forced one of the leading private sector waste contractors out of the hazardous waste disposal business in the province. A state-of- the-art

replacement completed in 1993 has not been commissioned for use, due to disputes with a neighbouring community. A complicating factor has been the question of whether the province or central government has the final say concerning the opening of the site. Very little waste incineration takes place in South Africa at present, although current projects are investigating the feasibility of using some hazardous wastes and scrap tyres as partial fuel substitutes in cement kilns.

Following an instruction from Cabinet some years before the election, a study was launched on the environmentally safe management and handling of dangerous materials. The aim was to develop a national programme. Numerous task and working groups are studying issues such as packaging, storage and transportation, emergency response, insurance, and trade and communication. This study has been critically influenced by the controversial issuing in 1995 of a permit for the importation into South Africa of material containing cupric arsenate. Although this was not in contravention of the Basel Convention, a formal Commission of Inquiry has been set up to establish whether proper procedures were followed by the Department of Environment Affairs.

Although the South African government has signed a number of international environmental conventions in recent years, their ratification has lagged. A national policy document for ratification of the Framework Convention on Climate Change has been drafted. The Convention on Biological Diversity was acceded to in November 1995, when South Africa became the 135th signatory. A draft discussion document was released in March 1996. Extensive consultation will incorporate the views of a broad-based interest group, including traditional healers. The Basel Convention was signed in May 1994, but regulations governing the movement of Basel wastes have not been published. Draft regulations were published for comment some time ago. However, they have not yet been finalized due to disputes with certain lobby groups. The issue of signing and ratifying such conventions is also raised under the current environmental policy process.

A task group led by the Department of Environmental Affairs and Tourism is evaluating the role of environmental resource economics in environmental management. Policy scenarios are being developed which could be adopted, depending on the way general fiscal and environmental policy develops and the extent to which inappropriate subsidies can be removed and information sources developed. These scenarios will be used to determine the potential of market-based mechanisms to address environmental problems. In this case, the product is not a policy in the first instance but rather the considered support and information needed to develop such a policy. Over 3000 individuals have registered to participate in a formal consultation process, and discussion documents have been generated.

Environmental Impact Assessment regulations are expected to be published before the end of 1996, with the aim of making EIAs mandatory for scheduled activities. There is, however, great concern amongst the business community about the government's review capacities and consequently costly delays. At present, the capacity does not exist at either central government or provincial level to deal with such studies. The process has been going on for several years, with draft regulations published in the Government Gazette for public comment in 1994. At that time the business community supported the principle of EIAs, but expressed reservations about the ability of government to handle such reports in a timely fashion. Since then the provincial governments have been given the responsibility for implementing environmental policy and the publication of the regulations has been delayed until the nine provinces are satisfied with the approach.

In the absence of mandatory EIA procedures, South Africa has developed Integrated Environmental Management (IEM) Guidelines that have received general acceptance within industry. Experiences with EIA procedures in other countries have led to the realization that environmental assessments could become reactive, excessively negative and the cause of unnecessary expense and delays in the development process. An approach was needed that reflects South Africa's limitations and needs. The approach developed is iterative, interactive, and seeks negotiated decisions that balance developmental imperatives and environmental protection – one that identifies the fullest range of options. The IEM guidelines aim to stimulate creative thinking in planning and design, provide systematic evaluation of proposals, formalize the approval process, and ensure monitoring during implementation. The result is intended to ensure that social benefits outweigh the social costs of decisions.

Voluntary initiatives

Over the past few years a number of other significant voluntary initiatives have been launched by the business community, some of which have pursued higher environmental standards in order to secure or maintain international markets for their products.

The Industrial Environmental Forum (IEF) of Southern Africa, launched in 1990, is an association of cross-sectoral business leaders. It links in partnership with the World Business Council for Sustainable development, amongst others. It is funded by the business community and works at various levels to promote environmental leadership, sound environmental management, and a practical, cost-effective approach to environmental standards, policy and regulation. It has been a key force in promoting voluntary environmental impact assessments, and voluntary environmental auditing and reporting. It has been in the forefront of formulating environmental management systems standards both at local and international level, as well as participating in national and regional policy formulation. Its members commit to its own Code of Conduct and the 16 principles of the International Chamber of Commerce's Business Charter for Sustainable Development. To convert this public commitment into practical action, an Environmental Self-Assessment Programme that measures performance against the 16 principles has been adapted from an earlier American programme. The IEF works to promote effective self-regulation and the use of economic instruments, voluntary covenants and associated measures such as corporate environmental reporting. It has also worked with other countries to establish organizations similar to itself and promote similar approaches to environmental management. A Zimbabwean Environmental Forum was formed in 1993, followed closely by the Namibian Business Forum for the Environment. In 1995 a Mozambican counterpart, Forum Empresarial para Meio Ambiente, was formed. Commitments to form similar organizations have been made in Tanzania and other countries in the region.

The Responsible Care Programme was launched two years ago by the South African chemical industry. Its first voluntary audits are due to take place soon.

Conclusion

The opportunity to totally reappraise all existing environmental policies and institutions does not occur very often. The transition of South Africa to a democratic state has afforded this rare opportunity. It is not an easy process. The commitment to exhaustive consultation that incorporates interest groups coming from diverse cultural and linguistic communities has its pitfalls and frustrations. But the integration of environmental concerns into public policy depends upon an open system of government, wide disclosure of information, and an informed citizenry. Historically, South Africa has lacked these elements. If the process currently underway is successful, it will not only result in a revamped environmental management system with widespread legitimacy and participation, but may also provide some models for the rest of Africa. ◆

Industrial pollution inventory and management in Nepal

Surendra Raj Devkota, Bimal P. Koirala and Chiranjibi Gautum, Industrial Pollution Management Control Project, Ministry of Industry, Singha Durbar, Kathmandu, Nepal

Abstract

This article shows how Nepal, a relatively small and little-developed country, is applying up-to-date tools and thinking to assess the pattern and sources of industrial pollution, and is creating legislation in the light of the information obtained. To develop an industrial pollution inventory, emission factors taken from US EPA and WHO publications were used with figures from Nepal's 1992 census of industrial units with ten or more employees.

Résumé

Cet article montre comment le Népal, un pays relativement petit et peu développé, met en oeuvre des outils et des modes de pensée innovants pour évaluer les modes et les sources de pollution industrielle, et élabore sa législation à la lumière des connaissances acquises. Pour dresser l'inventaire de la pollution industrielle, les facteurs d'émission tirés des publications de l'Agence pour la Protection de l'Environnement (EPA) aux Etats-Unis et de l'OMS sont appliqués aux résultats du recensement des unités industrielles népalaises de dix employés et plus datant de 1992.

Resumen

Este artículo muestra cómo Nepal, un país relativamente pequeño y subdesarrollado, utiliza herramientas modernas y piensa determinar el patrón y las fuentes de contaminación industrial, y crea una legislación basándose en la información obtenida. Para elaborar un inventario de contaminación industrial, se tuvieron en cuenta los factores de emisión extraídos de las publicaciones US EPA y WHO, que incluían cifras del censo de Nepal de 1992 de unidades industriales con diez o más empleados.

Introduction

An industrial pollution inventory is ideally a comprehensive, accurate and current accounting of pollutant discharges. In addition to emission data, information contained in the inventory data system may include sources, dispersion mechanisms, pollution controls, and compliance information. A pollution inventory provides technical foundations for all the relevant authorities responsible for the improvement or maintenance of environmental quality (US EPA, 1981).

The rationale behind the development of such an inventory is that it can be used to obtain a rapid and comprehensive assessment. Previous studies were either geographically limited (for example, to the Kathmandu Valley) or concerned only some components, such as air emissions. A complete picture of industrial waste loads has been lacking so far, although the need for this kind of study in order to develop management strategies or action plans for Nepal's major polluting industries has long been acknowledged.

Nepalese industry

Industrial development in Nepal is still in an early phase. This sector's contribution to the Gross Domestic Product is estimated to be around 10 per cent. Altogether, the industrial sector is responsible for only about 3.4 per cent of Nepal's total energy consumption of 270.9 million Gigajoules. The 1992 Industrial Census indicated that the total number of manufacturing establishments in Nepal was 4271, of which 2174 were in the Kathmandu Valley. They employed 224,000 and 130,000 persons, respectively. (It should be noted that the establishments covered by this census employed ten or more persons per unit.)

A comparison of the number of major industries in the Kathmandu Valley and in Nepal as a whole is presented in **Figure 1**. Industries such as carpets, garments and printing are more or less centralized in the Kathmandu Valley. It should be noted that the Valley contains about 50 per cent of the country's total industries. The exact situation of small-scale industries (fewer than ten employees per unit) is still unclear. Nevertheless, based on a sample survey of 1991, the Central Bureau of Statistics has projected the number in operation throughout the country to be around 46,418. Estimated numbers of major small-scale manufacturing units are presented in **Figure 2.** Total employment in small-scale industries has been estimated at 141,000 persons.

Methods of developing an inventory

The main purpose of an industrial pollution inventory is to quantify all types of discharges. The actual quantification of discharges is accomplished through the use of source tests or material balances, or through the application of emission factors. Once the initial quantification effort is completed, the inventory should be regularly maintained by updating source activity information.

An inventory process comprises four basic steps: planning, data collection and analysis, development of an emission scenario, and data reporting. An inventory data system is a form of record-keeping, either manual or automatic, which should be designed to handle all source information deemed by the agency to be relevant to its programmes.

Actual quantification of industrial discharges is accomplished through the use of source tests, which is the most accurate method of estimating wastes. Material balance is commonly used to estimate discharges from many categories. Thirdly, emission factors can be employed when the relationship between process data and emissions is direct and relatively uncomplicated. Emission factors are derived from source tests, material balance, and engineering estimates.

The first step is to define the emission factor *ej* for pollutant *j*, using the following equation:

$$ej = \frac{\text{Ej, kg/yr}}{\text{Source activity, units/yr}}$$

The emission factor, *ej*, is normally expressed as kg/unit and is assumed to be independent of source size and production level. The quantities of any type of discharge depend, in general, on a number of factors which can be expressed in mathematical form as shown in **Figure 3**.

To develop the pollution inventory, emission factors (**Table 1**) taken from publications of the US EPA (1985-1991) and the WHO (Economopoulos, 1993) were used with production figures from Nepal's 1992 Industrial Census.

Accuracy of the inventory

The appropriateness of applying emission factors could be a matter of debate, since these coefficients were developed in advanced countries. Production processes differ among countries, thus influencing the inventory output. In applying the emission coefficients, we have tried to correlate them with the most relevant process technology. The US EPA itself has categorized these emission factors according to their accuracy.

Industrial discharge scenarios

A general industrial pollution discharge scenario has been computed from the 1992 data. All pollution loads should therefore be understood as referring to that year only.

Table 1
Emission factors used for the development of the pollution inventory

NSIC	Source types	Unit	TSP kg/unit	Waste vol. m^3/unit	BOD5 kg/unit	TSS kg/unit	Solid waste kg/unit
3111	• Slaughtering	LWK tonne	0	5.3	6	5.6	35
3112	• Dairy products	tonne of product	0	3.1	3.2	1.5	0
	• Ice cream	tonne of product	0	3	10.9	1.5	0
3114	• Canning/preserving of fruits and vegetables, juice	tonne of raw materials	0	3.7	5	0.5	220
3115	• Vegetable/animal oils & fats	tonne of oil product	0	5	210	325	4.7
	• Edible oil refining	tonne of product	0	6.8	24.9	24.6	0
3116	Grain mills						
	• Wheat	tonne of product	38	0	0	0	0
	• Rice	tonne of product	3	0	0	0	0
3117	Bakery products						
	• Bread/rusk	tonne of product	0	0	0.11	0.004	0
	• Dry pastry	tonne of product	0	0	0.7	0.005	0
3118	Sugar factories/refineries	tonne of product	10	0	0	0	0
3121	Noodle products	tonne of product	0	14	6.9	2.8	0
3131	Distilling/rectifying/ blending spirits	tonne of product	10	36	210	75	300
3132	Wine industries	tonne of product	10	36	210	75	0
3133	Beer	m^3 of beer	0.8	11	18.8	7.3	20
3134	Soft drinks	m^3 of product	0	4.3	2.1	0.7	0
3214	Textiles						
	• mercerizing	tonne of cotton	7	35	8	2.5	32
	• dyeing	tonne of cotton	7	50	60	25	0
	• printing	tonne of cotton	7	4	54	12	0
		tonne of synthetic	7	110	86	61	0
3214	Carpets & rugs	tonne of product	7	83	15	17	31
3231	Leather & leather finishing	tonne of hides	0	57	63.5	104	450
341	• Paper & products	tonne of product	10	61.3	31	18	50
	• Kraft coarse paper	tonne of product	10	125	5.5	10.5	
3513	Resin, plastic & fiber (including rubber/HD pipe)	tonne of product	17.5	0	0.5	1.7	175
3523	Soap production kettle boiling	tonne of product	45	4.5	6	4	0
3691	Structural clay products	tonne of product	35	0	0	0	0
3692	Cement production	tonne of product	122	0	0	0	0
3710	• Iron and steel hot rolling	tonne of product	7	42	0	34	18.3
	• Galvanizing	tonne of product	7	9.4	0	2.32	10.8

NOTE:
LWK: Live weight of animal killed
TSP: Total suspended particulates
TSS: Total suspended solid
BOD5: Biochemical oxygen demand (5 day)
For carpet washing only: 500 l/m^2 & 90 g BOD/$5m^2$

ASSUMPTIONS FOR CONVERSIONS:

1 buffalo = 450 kg
2 kg raw material = 1 litre of juice
1 square metre of carpet = 6 kg raw wool
3 square feet leather = 1 pair of shoes
3 pairs of rubber slippers = 1 kg
1 metre cloth = 250 g
1 piece garment = 250 g
1 brick = 2 kg
1 square metre carpet (ready) = 4 kg
2 kg hides = 1 square foot of finished leather
1 tonne sugar cane = 75 kg sugar
1 tonne mustard seed = 125 kg oil
2.4 litres molasses = 1 litre anhydrous alcohol
1 square metre carpet uses 6 kg wool

EMISSION FACTORS FOR FUEL:

Fuel	TSP (kg/tonne)	SO_2 (kg/tonne)
Coal	5A (ash 10%)	19.5 (sulphur 5%)
Wood	24	0.075
Diesel	1.25	17S (sulphur 1.8%)

HUMAN WASTES FACTOR:
Wastewater: 30 m^3/person/year
BOD: 16.4 kg/person/year
TSS: 25.5 kg/person/year
Solid waste: 250 kg/person/year

Air pollution

The main sources of airborne pollutants from industry are the combustion of fossil fuels for heating and power, and waste gases and dust. Differences in the production capacities or fuel utilization patterns of Nepalese industries mean that emissions of different types of pollutants may cause localized air pollution problems. The total number of air-polluting units in Nepal is estimated at about 3156, around half of which are located in the Kathmandu Valley. Although emissions of TSP, CO, VOC, NO_x and SO_x have been identified for all of these manufacturing units, the present inventory is limited to TSP and SO_2 only.

Total suspended particulate (TSP) and sulphur dioxide (SO_2)

In general, the TSP load in the Kathmandu Valley from medium and large-sized industrial units is estimated at 104 tonnes per day. Brick kiins and the Himal cement factory contribute 77 and 20 per cent, respectively. It should be noted, however, that the operation of the kilns is seasonal (from November/December to May/June) and that their energy utilization is inconsistent. The cement factory, on the other hand, operates throughout the year. TSP emissions from other miscellaneous industrial sources are about three tonnes per day.

The ambient air quality monitored during 1993 in different industrial areas and traffic zones in the Kathmandu Valley showed major air pollution parameters such as TSP and SO_2 as more or less comparable between heavy traffic centres and some but not all of the industrial areas (Devkota, 1993).

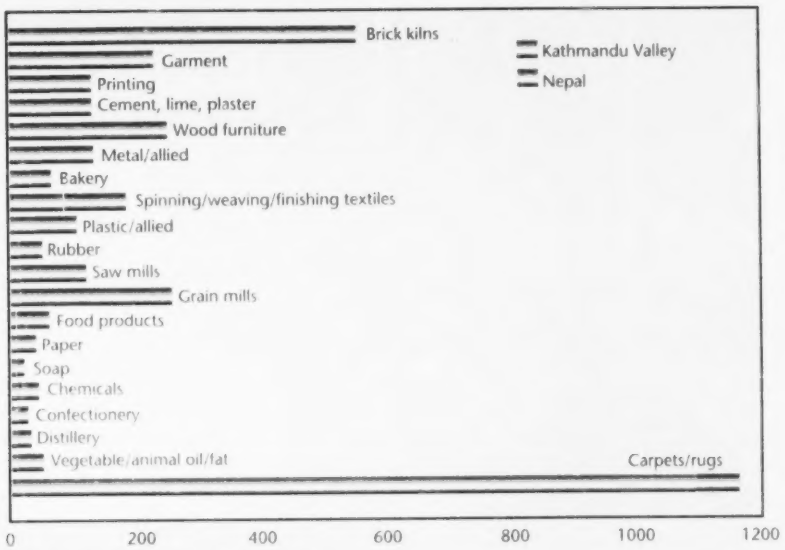
In the national context, structural clay products, together with cement and allied industries, contribute most of the TSP load in ambient air (**Figure 4**). In general, the major industries responsible for air pollution include brick kilns, cement factories, metal casting and allied industries , paper boilers, sugar mills and distilleries. The highest priority for corrective action will be given to the brick, cement, and other major coal- and boiler-using industries.

Sulphur dioxide emissions in Nepal for 1992 have been estimated on the basis of sectorial energy utilization (**Figure 5**). The industrial sector is the main contributor of sulphur due to combustion of coal and furnace oil. It is followed by the transport sector due to the burning of diesel fuel.

Water pollution

The quantity of water used by industry varies widely. Industrial processes which use water ultimately generate wastewater, resulting in pollution of nearby aquatic systems. Pollution of waterways can be caused by single factors or by a combination of different types of industrial discharges such as oxygen-demanding wastes, disease-causing agents, synthetic organic compounds, plant nutrients, inorganic chemicals and minerals, sediments, thermal discharges and oil. A general scenario of water pollution from industries in Nepal is presented in **Figures 6, 7 and 8** and **Table 2**.

Figure 1
Number of industries in the Kathmandu Valley and in Nepal



Note: Industries employing ten or more persons.

The Kathmandu Valley

The industrial effluent load in the Kathmandu Valley is alarming. It has been estimated that the total volume of industrial wastewater is approximately 2.1 million cubic metres. Nearly 76 per cent is contributed by carpet factories (1.6 million m^3), followed by dairy products (162 thousand m^3), textile finishing (66,700 m^3), leather and leather products (62,700 m^3), soft drinks and carbonated water (52,000 m^3), beer manufacturing (51,000 m^3) and the distilling, rectifying and blending of spirits (50,000 m^3). The total BOD load of the different industrial sectors is about 1150 tonnes. The total TSS effluent load is about 1417 tonnes (Devkota and Neupane, 1994).

Solid wastes

At present, the majority of industries do not seem to be concerned about solid wastes generated in the production process. Practices include discarding wastes outside the factory perimeter, mixing them with other municipal wastes, dumping them in nearby open places or on river banks, or burning them in the open.

The total solid waste generated by different industries is estimated to be 21,900 tonnes (**Figure 9**). In the Kathmandu Valley, out of a total of 1421 tonnes, 495 tonnes of solid waste is contributed by the leather industry, 417 tonnes by distilleries, and 173 tonnes by industries canning and preserving fruits and vegetables.

In general, leather, canning, sugar, distilling, wine, plastic and rubber are the principal industries contributing solid wastes in Nepal. A large percentage of these wastes is biodegradable, with the exception of plastic, rubber and bottles, which can be either recycled or reutilized by other industries through the introduction of a waste exchange system.

Overall scenario

The amounts and types of industrial pollution, and the industries contributing to this pollution load, are summarized in **Tables 2 and 3** according to the different regions of Nepal.

In the Kathmandu Valley, water pollution control measures should be a priority in industries such as carpets, dairy products, textile finishing, leather, beer and distilling. Outside the Valley, in the Eastern, Central and Western development regions, industries such as sugar, leather, paper, vegetable/animal oil and fats, beer, distilling, and iron and steel-based industries are commonly contributors to water pollution. The Eastern Development Region comprises two additional sectors (soap, and canning and preserving of fruit and vegetables). In the Far and Mid-Western Development Regions, sugar and distilleries are the only polluting industries.

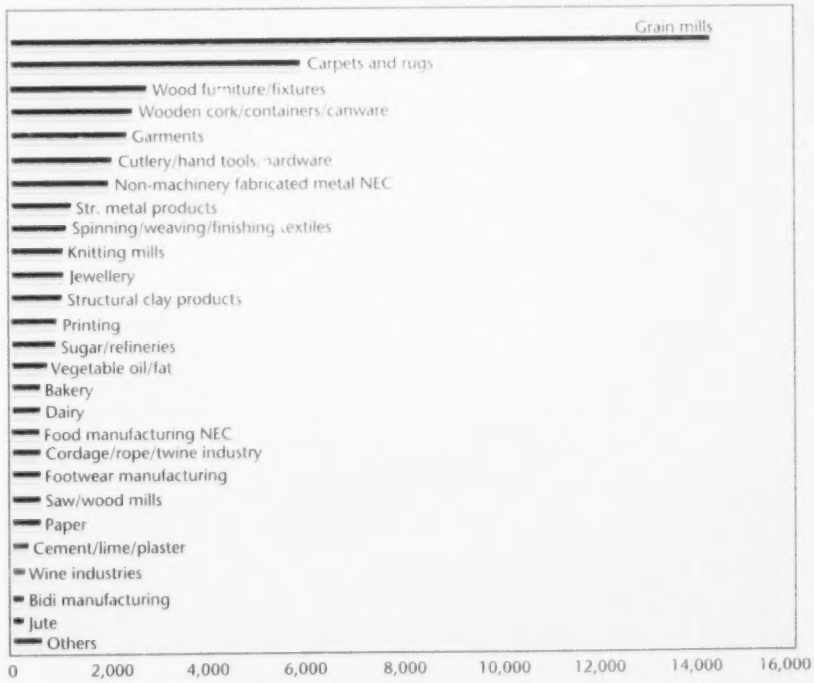
This inventory of industrial pollution in the Kathmandu Valley and in Nepal indicates that the development of a pollution management strategy for air pollution should focus primarily on the cement and brick industries. The strategy for water pollution should focus on the carpets, leather, pulp and paper, sugar and distilleries, textile finishing, vegetable oil, and iron and steel-based industries (**Table 3**).

Similarly, the industrial discharge parameters which need to be considered for immediate action in different types of industries are TSP and SO_2 (air pollution) and BOD, and TSS (water pollution). The industries themselves should be aware of the need to minimize waste and recycle wastewater. If possible, a barter system should be organized for the exchange of wastes among industries.

Industrial pollution management strategy

The control measures that will be described are the forerunners of a more permanent policy to be formulated in the next few years. The introduction of this strategy will depend on the availabili-

Figure 2
Small-scale manufacturing units in Nepal



Note: Units employing fewer than ten persons.

ty of proper waste recuperation and disposal facilities in Nepal.

Experience in many industrialized and industrializing countries has shown that there is strong public dissatisfaction with past industrial waste disposal practices. While it has been difficult to demonstrate any clear links between the disposal of industrial wastes and human ill-health, this has not deterred public demand for increasingly strict controls over industrial waste management.

While public health risks arising from uncollected *municipal domestic waste* probably far exceed the risks from industrial waste at this time in Nepal, public opinion may not fully agree. Public views on industrial waste have had a powerful and persuasive effect on industrial policy in most countries. Because Nepal is not likely to be an exception, it is prudent to take the first steps in the process of waste control.

The guidelines that follow are intended to be a modest but timely step to demonstrate care on the part of industry for public well-being. The primary needs are:

- to identify and classify wastes in a manner that reflects the risks posed to public health;
- to identify temporary measures that can be taken to recuperate, immobilize or destroy wastes;
- to define a waste management plan that provides public health protection until a more permanent system can be established.

The Ministry of Industry has initiated a plan to look after the environment in the framework of sustainable industrial development. Henceforth, both pre- and post-investment consideration of the environment by manufacturing units is being introduced. Pre-investment attention to the environment by industries has been stimulated by the introduction of Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) in 1995. Prior to obtaining an industrial license, the proponent is required to submit either an EIA or an IEE study regarding the nature and capacity of the proposed industry. The work of industrial entrepreneurs is facilitated by the IEE checklist and matrix. The industrial development trend in previous years shows that a majority of new industries will fall into the IEE category. Since 1994, the EIA and IEE have been reinforced by the adoption of an industrial siting policy.

Figure 3
Factors affecting the amount of discharge

Pollution load E of pollutant j $(Ej) = f$

(where f = source size and type; process/design particularities; source age and technological sophistication; operational practices used; type and quality of raw materials; type, design and age of the control system; ambient conditions; etc.)

(Economopoulos, 1993)

Figure 4
Sectorial TSP contribution in Nepal

(Total TSP = 76,390 tonnes)

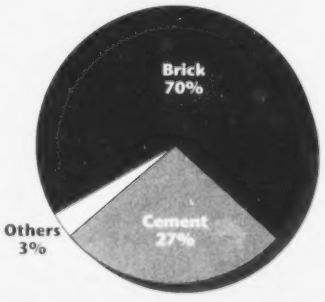
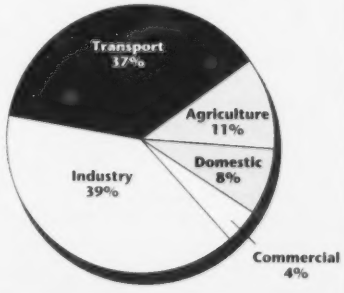


Figure 5
Total SO_2 emission contributions in Nepal

(Total emission = 12,300 tonnes)



Laws and regulations

The 1992 Industrial Enterprises Act was passed to enhance industrial productivity and encourage industrial investment. Environmental protection, as introduced in this law, is to be exercised by industries falling within its scope, which include most of the major industries whose operations might conceivably jeopardize security, public health or the environment.

The basic rules for the emission of wastes discharged to air and water are contained in a document entitled "Industrial Pollution Control Regulation for Air and Water Discharges (1994)". However, these rules are not enforceable until accompanied by standards, mostly expressed numerically in terms of the maximum allowable discharges permitted for a given industry. Once these industry-specific standards are published, the combination of rules and standards will become immediately enforceable for the particular industry.

The Ministry of Industry is allowed two years to publish the first of these industry-specific standards. It must publish standards for other industries at reasonable intervals afterwards. The choice of the first and succeeding industries rests with the Ministry, and will undoubtedly be based on both priorities of need and the Ministry's human resources.

Existing industries

Before any industry-specific standards are published, the Ministry will send an application form to each company falling under Annex 2 of the 1992 Industrial Enterprises Act (**Table 4**). This form will ask for information on raw materials, production, power, waste generation, waste treatment and disposal facilities, waste stream separation practices, etc. It will be advisable to be frank and helpful at this stage, as the Ministry will compare estimates with those published from similar industries in other countries. More importantly, the Ministry will use the data provided in its negotiations with industry to devise long-term environmental control programmes.

In the short term, the Ministry will issue provisional Environmental Permits. These permits allow companies to continue operating largely under prevailing environmental conditions – though possibly with some modest housekeeping improvements – until the appropriate industry-specific standards are published. The benefit of the permit is that a company will not be prosecuted for pollution unless it is either grossly negligent or wilfully discharges amounts that cannot be overlooked.

In the period between the issuing of the provisional Environmental Permit and the publication of industry-specific discharge standards, the Ministry will start negotiations with those industries requiring early attention.

The Ministry's intention is to establish a schedule of abatement tasks that an industry can realistically accomplish. Clearly, industry cannot comply with internationally accepted discharge standards overnight. Experience in most countries shows that compliance usually takes many years. For some industries, the process may typically require 20 years. There is no hard and fast rule. The duration depends on the state of the economy, as well as the time required to design and build treatment equipment and find capital funding.

Time will be allowed to identify cost savings derived from mini-

Table 2
Overview of the industrial pollution load in Nepal

Development Regions	Parameters				
	TSP (tonnes)	Wastewater volume (m^3)	BOD (tonnes)	TSS (tonnes)	Solid waste (tonnes)
Kathmandu Valley	37,857	2,100,000	1150	1417	1421
Central (excluding Kathmandu Valley)	19,950	2,160,000	1284	2317	8622
Eastern	6626	3,450,000	1424	3614	9560
Western	5505	699,000	1054	1350	1615
Mid-Western	2610	43,000	336	300	287
Far Western	3835	105,000	493	593	378
Total	76,383	8,556,997	5741	9591	21,883

mizing the use of raw materials and the waste of energy. It is difficult to over-stress the importance of waste minimization. Most companies, even the best, tend to overlook quite simple practices that waste money. Poor water management is a common example. Overstocking of raw materials is another. Excessive use, without recovery, of process chemicals is a third. Experience in many countries shows that strong waste management, particularly simple housekeeping, can reduce a company's wastes by as much as 30 or 40 per cent. These wastes cost money if they are discharged.

The Ministry urges every company to commit itself to a waste minimization programme. Each step of every process should be critically examined to see where wastes can be eliminated, changes made, and money saved. Sooner or later, companies will spend money on waste treatment. These costs are likely to substantial and they, too, must therefore be minimized.

The Ministry must be convinced that companies will undertake an environmental management programme, usually over several years, that will culminate in attaining industry-specific discharge standards. This programme should preferably start with waste minimization and cost savings, and then move into a phase of expenditure on residual waste treatment. The latter phase should provide companies sufficient time to raise

Table 3
Regional distribution of major polluting industries

Development Regions	Parameters				
	Wastewater	BOD_5	TSS	TSP	SO_2
Kathmandu Valley	Carpet, dairy, textile finishing, beer, distilling, leather	Carpet, vegetable oil, dairy, beer, distilling, leather	Carpet, dairy, veg. oil, distilling, leather	Cement, structural clay products (bricks)	Cement, bricks
Central (excluding Kathmandu Valley)	Sugar, paper, leather, veg. oil, beer, distilling, iron/steel	Vegetable/ animal oil, distilling, leather, beer, sugar	Vegetable/animal oil, leather, sugar distilling, iron/steel	Cement, bricks, sugar mills	Cement, bricks
Eastern	Leather, canning, preserving of fruit and vegetables, sugar, vegetable/ animal oil, distilling, soap/allied, iron/steel	Leather, veg. oil, distilling, canning and preserving fruits and vegetables, sugar, soap	Leather, canning and preserving fruits and vegetables, vegetable oil, distilling, soap, iron/steel	Cement, bricks	Cement, bricks
Western	Leather, sugar, distilling, paper, iron/steel	Sugar, distilling, veg. oil, leather	Sugar, veg. oil, leather, distilling, iron/steel	Cement, bricks	Cement, bricks
Mid-Western	Distilling, veg. oil	Distilling, vegetable/animal oil	Veg. oil, distilling	Bricks	Bricks
Far Western	Sugar, distilling, veg. oil.	Sugar, veg. oil, distilling	Sugar, veg. oil, distilling	Bricks	Bricks
Minimum cut-off value	50,000 m^3 except M/FWDR	50 tonnes	50 tonnes	100 tonnes	Not possible

N.B. Minimum cut-off value, e.g. 50,000 m^3, has been taken arbitrarily as minimum effluent load of each sector.

Figure 6
Major industrial sectors responsible for effluent load in Nepal

(Total wastewater volume = 8.55 million m^3)

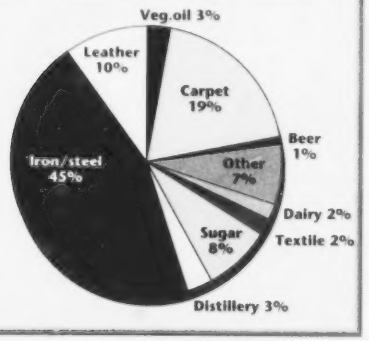
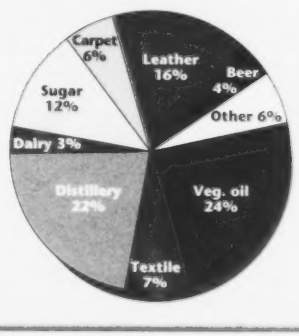


Figure 7
Major industrial sectors responsible for BOD load in Nepal

(Total BOD = 5741 tonnes)



capital, as well as to design and construct waste treatment works. The Ministry will negotiate these abatement programmes with companies. It will also require that intermediate goals be met, to ensure that abatement schedules are not slipping.

The negotiated programmes will be formalized in Control Orders, intended to be realistic and practical while preserving a degree of flexibility in the Ministry's enforcement. As long as a company maintains the negotiated schedule of tasks set out in a Control Order, the Ministry will not prosecute. If compliance dates are missed without good reason, the Ministry has the right to prosecute although prosecution is not automatic. Circumstances may dictate that prosecution is unnecessary or inappropriate.

The Control Order is an instrument of considerable flexibility. Nevertheless, it keeps the Ministry in firm control of the progress of abatement. A Control Order can be re-negotiated if circumstances change. When an industry-specific discharge standard is published, companies in that industry will be given a permanent Environmental Permit (the provisional permit will lapse and be withdrawn), together with a Control Order if the companies were not already in compliance. Eventually the Control Order will lapse as the last tasks are completed. The companies will then operate under the permanent Environmental Permits.

In the meantime, companies will be given the time necessary to minimize wastes and build treatment works while under a high degree of immunity from prosecution. The Ministry will have flexible but firm control over pollution abatement. The first essential is that every manager and worker will be aware of the need to reduce wastes and cut costs. The second essential is that every manager and worker will be aware that an industry must find the best way it can to fit into its neighbourhood, with the minimum cause for public complaint. Good public relations and sensitivity in dealings with neighbours are good business.

New industries or extensions to existing industries

As mentioned earlier, new industries in the Annex 2 category are subject to environmental assessment. The process of obtaining an Environmental Permit for new industries, or for the expansion of existing industries, closely follows the pattern described in the previous section. The important difference is that, generally speaking, the Ministry will expect an applicant for a provisional or permanent Environmental Permit either to achieve immediate compliance or to attain compliance with industry-specific standards in a much shorter time than an existing industry. The actual time period is a matter of the Ministry's judgement. It will be based on factors such as land use

Table 4
List of Annex 2 industries mentioned in the Industrial Enterprises Act, 1992

Cigarettes, bidi, leather tanning, beer, alcohol, sugar production, pulp and paper, cement, textile dyeing and washing, bitumen, chemicals, fertilizer, pesticides, lubricating oil, foam, carpet dyeing and washing, soap, electroplating, photo processing, tyre tubes, petrol and petroleum products, mineral-based industries, hydroelectricity generating plants, stone crushing, paints, brick making, forest-based medium and large-scale industry.

Figure 8
Major industrial sectors responsible for TSS load in Nepal

(Total TSS = 9591 tonnes)

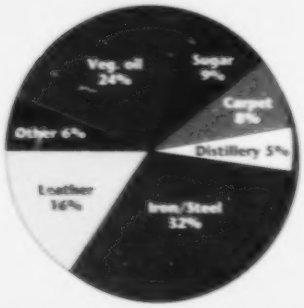
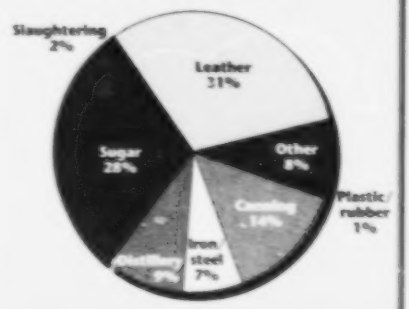


Figure 9
Sectorial solid waste contribution of industries in Nepal

(Total solid waste = 21,900 tonnes)



near the applicant's premises, the nature of the industry, and of course the technical difficulty of achieving compliance with industry-specific discharge standards. The Ministry's evaluation of a new industry or an industry expansion will seek to ensure that it will be in compliance or reasonably close to compliance with industry-specific standards. Nevertheless, the Ministry will be as reasonable and flexible as circumstances, including local land use, permit.

Provisional Environmental Permits may be issued to applicants prior to the publication of the appropriate industry-specific discharge standards. These provisional permits will be replaced with permanent Environmental Permits, together with a Control Order for those companies not in immediate compliance with the appropriate industry-specific discharge standards.

The intention of the regulation is to provide environmental protection. It is also intended that this protection will be achieved in a way that stresses management and not prosecution. It is flexible in character, but it keeps the Ministry – and the appointed enforcement agency – in firm control of events. However, true success for the Ministry will depend on persuading industry to adopt a modern approach to industrial management rather than relying on court actions and fines.

Finally, this approach provides a good start for industrial waste management. It also offers a challenge to the astute business manager with respect to environmental protection and, it is hoped, to new business opportunities.

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General environmental policies and clean technology in the Republic of Korea

J.S. Chung, Deputy Minister, Ministry of Environment, Government complex II, Kwacheon City, Kyunggi Province, 427-760, Republic of Korea

Abstract

The upgrading of the Korean Ministry of the Environment to cabinet level in 1990 strengthened the coordination of environmental affairs. A number of other ministries and administrative units also have responsibilities for environment-related policies or programmes. Since 1990, environment-related legislation has been completely revised. Economic instruments and Environmental Impact Assessment are being used increasingly. Clean technology development and cleaner production are widely promoted.

Résumé

Avec l'accession du secrétariat d'état coréen de l'environnement au rang de ministère en 1990, la coordination des affaires d'environnement a été renforcée. La responsabilité des politiques et des programmes à caractère environnemental est partagée par un certain nombre d'autres ministères et organismes administratifs. Depuis 1990, la législation portant sur l'environnement a fait l'objet d'une révision complète. Les instruments économiques et les études d'impact sont de plus en plus utilisés. Le développement d'une technologie respectueuse de l'environnement et la production plus propre sont vivement encouragés.

Resumen

El acceso del Ministerio Coreano del Medio Ambiente, en 1990, a nivel de Gabinete reforzó la coordinación de los asuntos medioambientales. Un buen número de otros ministerios y unidades administrativas también tienen responsabilidades respecto a políticas o programas relacionados con el Medio Ambiente. A partir de 1990, se ha revisado por completo la legislación relacionada con el Medio Ambiente. Los Instrumentos Económicos, y la Determinación sobre el Impacto Ambiental se usan con mayor frecuencia. A su vez, se fomentan ampliamente un desarrollo tecnológico limpio y una producción más limpia.

Introduction

Over the past 30 years, Korea has risen out of the depths of poverty and unemployment as it embarked on a programme of economic development. While the country's standard of living has improved greatly, economic success has also had its costs. Rapid industrialization, urbanization, and increasing consumption have inevitably given rise to pollution on an unprecedented scale. Environmental challenges are now emerging as a basic element of all national and international development strategies.

The government's first effort to tackle these problems was embodied in the Environmental Preservation Act of 1977. In the 1980s, with the personal income level steadily rising, the public began to voice its demands for a clean, healthy environment. As a result, the government began shifting its policy focus by establishing more stringent environmental standards, conducting Environmental Impact Assessment broadly, designating countermeasure zones, and transferring the costs of pollution treatment to the firms responsible. This sweeping change in policy orientation was realized through the rewriting of environment-related acts and the systematization of environmental administration. In 1990, the Environment Administration was upgraded to cabinet level as the Ministry of Environment (MOE), thereby strengthening the coordination function of environmental affairs among environment-related agencies.

Environmental problems have also become issues of global concern. Our government is therefore endeavouring to build partnerships with other governments by participating in international efforts to protect the global environment. It will continue to broaden its scope of responsibility for global environmental consultation, and will become increasingly active in international affairs.

The budget for the MOE in 1996 has increased to the equivalent of US$ 1,120 billion (1.05 per cent of the nation's total budget) from only US$ 15 million (0.186 per cent of the nation's total budget) in 1980, attesting to the increasing importance that sound environmental policy has taken on as the years have passed.

Environmental policy

Objectives of environmental policy

The Korean government has set the following environmental objectives, to be attained by the year 2001: 1) reduce the average level of SO_2 pollution in Seoul to 0.01 ppm; 2) raise the sewage treatment ratio to 65 per cent nationwide; 3) reduce the level of BOD in the Chamsil monitoring spot (Han River) to 1.5; 4) increase the sanitary treatment ratio of domestic waste at landfills to 92 per cent; 5) increase the recycle ratio of domestic waste to 20 per cent; 6) expand National Ecosystem Conservation Areas to cover 5 per cent of the country's total land area (to be achieved by the year 2005).

Responsibilities of environment-related agencies

Altogether, 13 ministries and administrative units of the central government, other than the MOE, have responsibilities for environment-related policies or programmes in Korea. The Ministry of Science and Technology is responsible for the control of transport, and the handling and disposal of radioactive industrial wastes. The Ministry of Home Affairs is responsible for the designation and management of national parks. Its Ocean Police Agency also oversees and enforces marine regulations for the prevention of marine pollution. The Ministry of Agriculture, Forestry and Fisheries, and the Forestry Administration, are responsible for the protection of wild birds and mammals, forestry and marine resources, and hunting regulations. The Ministry of Trade, Industry and Energy is responsible for the management of industrial complexes, the supply of low-sulphur oil, and research and development concerning new energy sources. The Ministry of Construction and Transportation, and the Marine and Ports Administration, are responsible for the designation of development-restricted areas, the management of rivers and lakes, and the formulation of measures to prevent port pollution. The Ministry of Labour formulates measures for the prevention of occupational diseases and the improvement of working conditions. The Ministry of Culture and Sports is responsible for designation, protection and management of rare fauna and flora and natural monuments.

Local governments are responsible for creating environment-related prevention policies in the areas under their jurisdiction, and for other activities delegated to them by the MOE. The regional Institutes of Environmental Research, under the local governments, are in charge of measuring and monitoring pollution levels.

Environment-related acts

Environment-related legislation was fully revised when the Environment Administration became the Environment Ministry in 1990. Existing environment acts are listed in **Table 1**.

Economic instruments

The MOE has put a number of economic instruments into effect for the implementation of the "polluter-pays principle".

The purpose of the 1993 Emission Charge System is to prevent damage to the environment due to pollutants discharged in excess of the specified standards, and to ensure that firms actually observe the permissible limits. Any firm found exceeding these limits must pay emission charges equivalent to the expense of treating the volume of the pollutant emitted.

The Deposit-Refund System for Waste Disposal went into effect in 1992. The Ministry has the authority to collect deposits from producers and importers to cover the costs of annual collection and treatment of those wastes which are designated as easily retrievable and recyclable. The producers and importers are reimbursed according to their retrieval and treatment performance.

The Waste Charge System was established in 1993 to promote waste reduction and resource saving activities. It charges fees necessary for the proper treatment of wastes to producers or importers of product materials and containers which are a source of harmful substances or are difficult to collect, treat or recycle.

The 1992 Environmental Improvement Charge System is imposed on the owners of commercial facilities with floor space, and on diesel-powered vehicles, in order to encourage pollution reduction and secure investment funds for the implementation of comprehensive environmental improvement plans. The rate is calculated based on the quantity of fuel and water used by the commercial facilities, and on the volume of exhaust emitted by the diesel-powered vehicles.

The objectives of the 1995 Volume-based Collection Fee System for Domestic Wastes include reducing the volume of general wastes generated from households and small businesses, and promoting recycling by imposing collection fees according to the volume of wastes generated.

Environmental Impact Assessment (EIA)

The 1977 Environmental Preservation Act introduced the Environmental Impact Assessment System. Urban development projects, the development of industrial sites, and energy development were thereby made subject to EIA for the first time. Years later, the Act was revised to cover ten types of projects including railroad construction, construction of airports, reclamation projects, and development of apartment complexes by the public sector. Rules and regulations stipulating methods of preparing EIA were announced in 1981, and the system was fully implemented in 1982. The Environmental Preservation Act, when revised again in December 1986, added development of tourist complexes by the private sector to the list.

Since 1990, provisions on Environmental Impact Assessment have been revised as follows:

- the types of projects subject to EIA have been increased to cover 47 projects in 15 areas;
- provisions to incorporate residents' opinions have been introduced;
- provisions have also been introduced for submission of objections to consultation results, re-consultation in the case of project changes, and supervision of the implementation of consultation results.

In order to rectify problems found during implementation of the EIA system, a separate Environmental Impact Assessment Act was enacted in 1993. The major improvements were: the types of projects subject to EIA were increased to cover 62 projects in 17 areas; provisions for consultation on assessment were improved; and the supervision of implementation of consultation results was strengthened.

Those who plan to carry out projects subject to the EIA must prepare a draft assessment, which is made public. A public hearing is held on the proposed project. The administrative agency responsible for project approval must request an MOE consultation and review of the assessment. After review by a committee of experts, the MOE announces the results of consultation. The decision on project approval by the responsible agency should reflect these results. When necessary, re-consultations should be arranged.

The implementation of consultation results must be monitored, and responsibility assigned for keeping records of the implementation procedures. After approval is granted, the project manager evaluates the post-environmental impact according to each assessment factor and submits the results of the evaluation to the MOE and the chief of the administrative agency responsible for the project's approval. Improper project implementation may result in the suspension of construction, up to five years imprisonment, or fines of up to 50 million won (approximately US$ 6500).

Table 1
Environment-related acts

	Date legislated
Basic Environmental Policy Act	Aug. 1990
Natural Environment Preservation Act	Dec. 1991
Environmental Impact Assessment Act	June 1993
Marine Pollution Prevention Act	Mar. 1991
Waste Management Act	Dec. 1992
Act Relating to Promotion of Resources Saving and Reutilization	Dec. 1992
Act Relating to Transboundary Movement of Wastes and Their Disposal	Dec. 1992
Toxic Chemicals Control Act	Aug. 1990
Act Relating to Punishment for Environmental Crimes	May 1991
Act Relating to Environmental Improvement Charges	Dec. 1991
Environmental Dispute Settlement Act	Aug. 1990
Air Quality Preservation Act	Aug. 1990
Water Quality Preservation Act	Aug. 1990
Noise and Vibration Control Act	Aug. 1990
Act Relating to Treatment of Sewage, Night Soil, and Livestock Wastewater	Mar. 1991
Environmental Management Corporation Act	May 1983
Special Account for Environmental Improvement Act	Jan. 1994
Korea Resources Recovery and Reutilization Corporation Act	Dec. 1993
Potable Water Act	Aug. 1990
Sewage System Act	Aug. 1994
Act Relating to Support and Development of Environmental Technologies	Dec. 1994
Drinking Water Management Act	Jan. 1995
Soil Preservation Act	Jan. 1995
Act Relating to Promotion of Construction of Waste Treatment Facility and Support of Inhabitants Near the Facilities	Jan. 1995

Clean technology

General description of government policies

As pollution prevention through the use of clean technology is more effective than post-treatment, the Korean government has been active in promoting environmental policies to eliminate the basic sources of pollution during rapid industrialization.

In the early 1990s, governmental bodies and industry recognized the importance of clean technology as a fundamental means of reducing pollution and a practical tool for pollution prevention. R&D activities, and the application of clean technology in cleaner production processes, are increasing steadily. Government policies for pollution prevention, including the use of clean technology, are implemented through Notifications or Acts (**Table 2**).

Policy instruments to support clean technology programmes

Financial support

General schemes for supporting clean technology R&D and application take several forms (**Table 3**).

Eco-labelling system

As of August 1994, the conditions for eco-labelling were established. At the time of writing, 187 products are permitted to use an eco-label.

Awards for clean technology development

An awards system was established in 1994 by a non-governmental body to promote the development and adoption of clean technology in industries and to disseminate the developed technology, both domestically and to foreign countries. The selection criteria are: degree of effort and content of the technology; source of the technology and pattern of development; degree of pollution prevention and economic improvement; durability, novelty and disseminability of the technology, etc. Three innovations received awards in 1994: a low-pollution oil filter (Trast Korea Co.), a manufacturing process involving a high-tension concrete tube (Palma Co.), and a waste solvent recovery and recycling process (Daewoong Chemical Ltd.).

Support measures

The Korea Environmental Technology Research Institute (KETRI), designated by the government

as a national technology centre in March 1995, will play an important role in providing information about the technology involved and environmental tools needed to develop and adopt clean technology, and in assisting other institutes or enterprises, especially small businesses. The UNEP Infoterra Programme in Korea is operated by the National Institute of Environmental Research. The information network being constructed by KETRI, financed by a loan from IBRD, will be in operation by 1998.

Other supporting programmes

The order of priority for the patent judging system was revised in 1994. The length of time it takes to receive patents related to defense-military technology and pollution prevention technology, including clean technology, has been shortened.

Current status of clean technology development

A number of projects are stimulating the development of clean technology. Through one such project, launched by the government in 1992, progress has been made in eleven research fields including environmental technology development. In addition, the Environmental Technology Development Project has been managed by the Ministry of Environment and supported by the Ministry of Trade and Industry and the Ministry of Science and Technology. The Low and Non-Waste Process Technology and Motor Vehicle Emission Control Technology project has been carried out as a clean technology sub-project. From 1998, the whole Environmental Technology Development Project will have been converted from end-of-pipe to pollution prevention concepts.

Table 2
Pollution prevention measures

- **The Act relating to Promotion of Economy and Reutilization of Resources** (1992) urges effective use of resources and recycling of by-products and wastes
- **The Notice of Environmental Label Permission Criteria** (1995) is a certification system for environmentally friendly products and cleaner products which aims to promote the development of clean technology and to increase awareness of environment protection
- **The Act relating to Environment Technology Development and Support** (1994) promotes the development of environmental technology, including clean technology and cleaner production

Table 3
Methods of providing financial support for clean technology

- Grants for R&D: mainly designed to give government financial support
- Loans for R&D: mainly from commercial banks
- Loans for an advanced industrial technology development project: purely focused on supporting innovation in environmental technologies with Industrial Development Funds
- Grants and loans to small businesses for R&D: implemented to foster these businesses' environmental programmes

Other projects include the development of non-polluting agricultural chemicals and of biodegradable polymers and surfactants (managed by the Ministry of Science and Technology), and a new energy project (managed by the Ministry of Trade and Industry). These projects are characterized by the development of green substitutes for polluting materials and of cleaner production processes.

Conclusions

The objectives of Korea's environment-related policies and legislation during the past 30 years have been to upgrade living standards and to manage natural resources effectively. Various acts and economic instruments have been introduced, as well as Environmental Impact Assessment, establishing more systematic and concrete foundations for a clean, safe environment. The Ministry of Environment has initiated "carrot and stick" policies which provide not only command-and-control, but also incentives to the all parties concerned.

Implementing clean technology development and cleaner production requires both capacity and willingness on the part of government and industry to bring about environmentally friendly transitions in their structures. Future government policy should be focused on: 1)training and education concerning clean technology and cleaner production; 2)activation of the catalytic role of government; and 3)economic and financial supports.

Finally, broad public awareness is more necessary than ever to create the right atmosphere for this campaign. It therefore includes environmental education in schools, active promotion of environmental preservation through the mass media, and so on. The strong support and advocacy of the public could accelerate and maximize the needed changes. ◆

Improving Environmental Impact Assessment

Niaz A. Khan, Senior Environmental Officer, Jebel Ali Free Zone Authority, P.O. Box 17000, Dubai, United Arab Emirates

In many instances an inadequate Environmental Impact Assessment (EIA) of areas committed to industrial development has led to poor siting, with consequent pollution problems and environmental degradation. Various actions can be taken to improve the quality and value of EIAs. If appropriately integrated into the industrialization process, EIAs can become a very important planning tool, primarily because they can be used to help identify alternatives such as site, manufacturing processes and raw materials.

To be of maximum use, EIAs should be applied from the time strategies and policies are determined and be continued through planning, construction, and even operation. Indeed, it is important that those concerned with setting up EIAs be able to monitor and obtain feedback through seeing the results of actual operations.

Some developers, faced with the requirement for an EIA, feel that it is just one more unnecessary encumbrance to be overcome. But an EIA should not be seen as such, for if properly carried out it has the potential to benefit both the environment as a whole and those who live in it, as well as an industry in the process of development. A diminished impact on the environment leads to sustained development and also to potential savings.

An EIA does not necessarily have to be exhaustive and comprehensive. A preliminary assessment should be carried out first. If this assessment indicates that the project is likely to lead to significant environmental impact, then a more detailed assessment is called for.

It is still somewhat contentious how broad in scope an EIA should be, but clearly the scope depends on the nature of the intended project and the country concerned, in so far as different countries have different priorities and criteria. Environmental criteria for industrial siting could include effects on climate and air quality, geology, water quality, availability of water, soils, ecology, environmentally sensitive areas, health, agriculture, fisheries, social and community structures, cultural characteristics, and income and income distribution. In particular, the EIA should examine adverse effects which cannot easily be remedied later. For example, it may prove too expensive to incorporate pollution control equipment after a plant becomes operational. It would therefore have been better to assess such problems during the planning stage.

Certain countries have introduced what they term a "scoping process" by which they delineate the scope of an EIA. Some emphasize ecological aspects, while others are equally concerned with the socio-economic effects of development. Depending on the conditions prevailing within its territory, each country will identify and define those environmental components which it considers important. The EIA procedure will thus have to be flexible and fit into that specific framework.

Some experts believe that all the factors pertaining to an EIA should be quantified and given a monetary value. Although this might be desirable in some instances, an EIA should place more emphasis on the consequences of development in real terms for the communities concerned. Thus farmers would like to know the effects of air pollution on their crops, while those concerned with health are interested in the effects of water pollution on the quality of drinking water and on the risk of illness. There again, the community will want to know how many jobs the new industry will create and its effect on the community.

To serve a useful function, EIAs must be presented in terms which can be readily understood by both decision-makers and members of the community who will be affected by the development. Until recently, some people were apprehensive of EIAs because they believed they required detailed, voluminous statements. However, the quality of an EIA is critical. It is extremely important that those concerned with making the assessment be thoroughly experienced and of high calibre.

In the past, many planning processes have taken place without consideration of the concerns and viewpoints of those affected. The public should be involved in the planning process, and should therefore be brought into the EIA. Some have advocated that, better still, the public should be able to participate in the decision-making process. Obviously the degree of public participation will depend upon the institutional system that exists in any one country.

Governments could consider establishing a review office, one of whose functions would be to conduct preliminary environmental assessments for industrial projects as well as to ensure that more comprehensive assessments, if deemed necessary, are carried out either by its own staff, with the help of specially qualified teams, or by the project proponent.

Once the EIA has been conducted, the review office should submit it to the appropriate regulatory agency so that EIAs can be integrated into planning requirements. Ideally, the function of the review office and the performance of the EIAs should be subjected to minimum bureaucracy. As a necessary part of any project appraisal, EIAs are likely to receive the approval and backing of the organizations and agencies most concerned with large-scale industrial development and projects. This support in itself should ensure that EIAs become an essential part of the planning process.

Although the development of a large-scale industrial project takes place in one country, its effects may be felt in a neighbouring country – the construction of a plant with effluent flowing into a shared river, for example, or the fall-out of sulphur dioxide far away from the source of pollution. Consequently, some countries consider that international EIAs are necessary for those projects whose environmental impacts will be felt by more than one country. As Environmental Impact Assessment evolves and becomes more widespread as an integral part of the planning process, no doubt countries will demand that its scope be broadened and focused to deal with internationally sensitive development issues.

To further improve the quality and value of Environmental Impact Assessments and Environmental Impact Statements, there should also be a focus on adoption of pollution prevention and cleaner production. Technologies that use fewer resources are more energy-efficient and generate less waste, emissions and effluents. Pollution control equipment should be operated to design standards in order to achieve emission targets. Improved environmental assessment should encourage cleaner production in order to reduce the risks to humans and the environment. Such an assessment should evaluate the cleaner production alternatives of a technological system, that is, the alternative ways of designing and operating the technology to conserve raw materials and energy, eliminate toxic raw materials, and reduce the quality and toxicity of emissions and wastes.

The Environmental Impact Assessment should also use the emerging science of environmental risk assessment to provide better information to decision-makers in order to ensure the achievement of sustainable development.

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Towards a pan-European environmental management programme for golf in Europe

David Stubbs and Liz MacGregor, European Golf Association Ecology Unit, Chaussée de la Hulpe 110, B-1050 Brussels, Belgium

Abstract

Golfing authorities in Europe established the European Golf Association Ecology Unit in January 1994. During 1995, in conjunction with the European Commission, a pilot scheme was carried out to determine whether an environmental audit could be undertaken on golf courses. Over the next few years, it is intended to develop an Environmental Management Programme for Golf Courses in Europe. Many of the principles and policies involved are also applicable in other golfing regions of the world.

Résumé

Les instances européennes du golf ont mis sur pied l'Unité Ecologie de l'Association Européenne de Golf en janvier 1994. Au cours de l'année 1995, en conjonction avec la Commission des Communautés, était lancé un programme pilote visant à déterminer s'il était possible de réaliser un audit environnemental des terrains de golf. Au cours des prochaines années, il est prévu de développer un programme de gestion de l'environnement dans les clubs de golf européens. Un grand nombre des principes et des politiques énoncés sont également applicables dans d'autres régions du monde où ce sport est pratiqué.

Resumen

Las autoridades del Golf en Europa establecieron la Unidad Ecológica de la Asociación Europea de Golf en Enero de 1994. Durante 1995, en asociación con la Comisión Europea, se ejecutó un esquema piloto para determinar si se puede realizar un control ambiental en los campos de golf. Durante los próximos años, se tiene el propósito de desarrollar un Programa de Gestión Ambiental para los Campos de Golf en Europa. Muchos de los principios y políticas implicadas también se pueden aplicar a otras regiones del mundo donde se practique el Golf.

Golf course construction is one of the world's fastest growing types of land development. The game is a major component of the leisure and tourism industries. In Europe there are 5000 existing golf courses occupying approximately 200,000 hectares. Worldwide there are about 30,000 courses, used by tens of millions of players.

Any activity on this scale inevitably has significant environmental implications. Indeed, there has been much press coverage and speculation about the impacts of golf course development and the amount of resources used in maintaining golf courses. Similarly, the relationship between sport as a whole and the environment is becoming a major new field of study, both in respect of the impact of sports facilities and events on local environments and the quality of these environments for athletes (Chernushenko, 1994).

Golf courses certainly have a two-way relationship in this context, not just relating to water and chemical usage but also to the management of wildlife habitats and the conservation of biodiversity, energy efficiency, and environmental education. It is a complex matter, in which the many positive as well as negative aspects of golf need to be understood and fed into the debate. Certainly, environmental issues are one of the most important factors affecting the development of the game of golf today.

In recognition of this, in January 1994 the Royal and Ancient Golf Club of St Andrews, the Professional Golfers Association European Tour and the European Golf Association (EGA) established an Ecology Unit based in Brussels. This initiative is the first full-time ecology department generated from within the golf industry by the game's leading authorities. The Ecology Unit is golf's means of providing a coordinated and professional approach to environmental issues affecting the construction and maintenance of golf facilities throughout Europe.

Pilot scheme

The EGA Ecology Unit and the European Commission's Environment Directorate General, DG XI, are working together on a Pilot Scheme to develop an Environmental Management Programme for golf courses. The primary aim is to promote greater awareness and understanding of the environmental aspects of golf course management and to encourage golf clubs and golf facility managers to combine sound management with environmentally responsible methods. The scheme is based on the principles of the European Commission's Eco-Management and Audit Scheme (EMAS), but adapted to the specific circumstances of golf courses.

Eight golf course sites were chosen for the scheme. Although small, it was felt this would be a sufficient sample to cover a range of situations across Europe including a spread of ages and types of golf course. The eight courses are: Golf and Countryclub Oudenaarde, Belgium; Le Golf National, near Paris, France; Golfclub Cas-

trop Rauxel in Frohlinde eV, Germany; Golf Club Milano, Italy; Vila Sol, Algarve, Portugal; Club de Golf Valderrama, Andalucia, Spain; Ljunghusens Golfklubb, Skanor-Falsterbo, Sweden; and Linlithgow Golf Club, Scotland.

Local ecologists undertaking the fieldwork were asked to look at five areas in particular: planning and policy; water resource management; pollution control; nature conservation; and information and education.

The results showed examples of good environmental practice as well as several aspects in need of improvement. Most problem areas appear to be due to a lack of awareness and/or communication, rather than inherent in golf course management. The key strengths and weaknesses are highlighted below.

- Many golf clubs do not have any formal management policy for addressing environmental issues, although they recognize environment as an important subject and appear willing to adopt appropriate new measures.
- Where environmental initiatives are already in place, too much reliance is placed on too few individuals.
- Record-keeping of management activities is often poorly organized, hindering effective monitoring and continuity.
- High water consumption is widely regarded as the most important environmental effect of golf course operation, yet some clubs are very vague in their approach to water resource management and conservation. However, several water conservation measures were identified and will form the basis of future guidelines.
- The use of fertilizers and pesticides is generally moderate, and in some cases negligible, but even on low-use sites greater care should be taken over the storage and disposal of hazardous products.
- Golf courses have much to contribute to nature conservation. The most striking evidence is the number of birds (132 species were recorded on the pilot scheme sites, representing 25 per cent of Europe's avifauna), but all wildlife groups can potentially benefit. Some golf courses may also provide valuable habitat links or buffers between protected areas.

Aeration pump on the upper lagoon at Vila Sol, Portugal, where treated effluent water is being recycled.

Examples of environmental initiatives already underway in golf courses in Europe

Le Golf National, France	A new fertilizer and golf course maintenance policy leading to significant reductions in chemicals and water usage, and cost savings in energy and labour
Linlithgow Golf Club, Scotland	Starting a tree planting scheme, revising the mowing programme system to extend areas of wild flower roughs, and creating new wetland areas
Sunningdale Golf Club and Lindrick Golf Club, England	Initiating a heathland restoration project, including clearing forests and re-establishing heather communities
Club de Golf Valderamma, Andalucia, Spain	Designating sanctuary areas for wildlife, and including nature notes in the club magazine
Ljunghusens Golfklubb and Skanor-Falsterbo, Sweden	Maintaining the pond margins to provide suitable habitats for green and natterjack toads
Quanta des Lago, Portugal, and Anderstein Golf Club, the Netherlands	Developing nature trail guides

- Data from "new" golf courses (opened in 1990 or later) confirm that these courses have improved local biodiversity. Obviously, however, all new golf course development projects should be treated on their merits with regard to potential ecological impact.
- Environmental initiatives can be cost-effective and even realize significant financial savings.
- Environmental initiatives are compatible with normal golf course management.
- Communications, both internally between members, managers and staff, and externally, with the local community and public authorities, are weak.

Why is an Environmental Management Programme for golf important?

Continual improvement. Knowledge of environmental management principles and techniques is continually developing. As a concept, Best Management Practice (looking at all the factors and constraints involved in managing the land on the golf course, with the aim of maximizing the environmental benefits) embodies the aim of continual improvement: even good clubs can get better.

Responsibility. We are all responsible for looking after the environment, collectively and individually. Many managers accept that they have a responsibility as environmental stewards. The question is: How?

Multiplier effect. Simple, small actions on individual courses become significant initiatives when repeated many times over. Participating golf clubs will set an example and could lead the way for greening other sports and leisure activities.

Conservation of biodiversity. Golf has a major role to play here, through direct measures to protect or create wildlife habitats and through more rational management practices relating to pest control and general turf management.

Awareness. Millions of people play golf. Any golf-environment programme has the potential to make a significant contribution to environmental education.

Developing an environmental management programme

The results of the fieldwork were discussed at an International Workshop in October 1995. This was the first ever round-table meeting between the major golfing bodies and leading environmentalists, together with the European Commission.

It was agreed that a structured Environmental Management Programme should be developed. It would take account of the diverse environmental, legal and cultural factors affecting golf courses at both national and regional levels. A primary aim of the programme will be to promote greater public awareness of the environmental attributes of golf courses.

In order for the programme to work on a wider basis:

- Involvement in an Environmental Manage-

ment Programme for golf courses should be voluntary.

- Enthusiasm and goodwill towards improving environmental performance should be encouraged from the bottom up, i.e. from within golf clubs.
- There should be active collaboration with environmental bodies, non-governmental organizations, and regional and local authorities.
- It must be challenging but not frightening, so that golf clubs will be prepared to participate.
- It must be sufficiently flexible to cater to the variety of types of golf course, as well as their different locations and legal, cultural and environmental situations.
- It must be compatible with sound golf course management and be able to make a valid contribution to environmental protection and enhancement.
- It must be accepted and recognized by official agencies and environmental organizations.

The programme outlined below builds on the Pilot Scheme. It also takes on board elements of other programmes already in operation, in particular the Audubon Cooperative Sanctuary Program, USA, and the Scottish Golf Course Wildlife Initiative. The structure closely matches the European Commission's Eco-Management and Audit Scheme (EMAS).

Golf club joins the programme

Environmental Review
Internal assessment of the current environmental status of the course

Environmental Management Programme
Recommendations in the form of a flexible management plan

Environmental Audit
Periodic and regular reviews of the whole programme

Environmental Statement
Recording the golf club's achievements

Verification
Providing a guarantee of objectivity

Publication
of the environmental statement

The Environmental Management Programme looks at ways to improve the environmental performance of all aspects of golf course maintenance.

Conclusions

The environmental issues facing golf are perfectly possible to resolve. There is no inherent reason for golf courses to cause environmental damage, and there are many opportunities for golf to be a force for environmental good. However, this will not happen automatically and there is no room for complacency. Implementation of an Environmental Management Programme will depend on close cooperation and communication between the various golfing bodies, environmental organizations, and local and regional authorities.

The initiative for the Ecology Unit came from within the golfing industry. It is vital that Europe's top golfing bodies continue to provide leadership, encourage the development of environmental programmes,and work in partnership with others. Many of the principles and policies outlined here are applicable in other golfing regions of the world. Environmental issues are a global concern. It is certainly the hope of the EGA Ecology Unit that our work and ideas, with the help of organizations including UNEP, will be widely disseminated and contribute to the golf-environment debate.

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Tourism News

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International Ecolodge Forum

The second International Ecolodge Forum and Field Seminar took place on 22-29 October in Costa Rica. It was organized by the Ecotourism Society. Issues such as planning and sustainable design of ecolodges, ecolodge infrastructure, services and operation, natural resource conservation and community development were addressed through case studies and discussions. UNEP IE participated in the final summary panel, "Analysis, Criticism and Realities of Ecolodges from the Viewpoint of the Various Sectors Involved". The Ecotourism Society will finalize and publish guidelines based on the inputs of the Forum.

For more information, please contact: The Ecotourism Society, P.O. Box 755, North Bennington, VT 05250, USA. Fax: +1 (802) 447 2122. ◆

Follow-up of the Environmental Action Pack for Hotels

UNEP IE organized a technical assistance project to assist EP3, acting in Tunisia as a National Cleaner Production Centre, in adapting the "Environmental Action Pack for Hotels", jointly published by UNEP, IHEI and IHA, to the specific needs of the Tunisian hotel industry. An action plan to mobilize the industry towards better environmental practices was also proposed. Several countries and companies are already translating and adapting the "Action Pack" with the authorization of the three organizations holding the copyright.

For more information, please contact: UNEP IE, Fax: +33 (1) 44 37 14 74 or IHEI, Fax: +44 (171) 321 6480. ◆

Caribbean Conference on Sustainable Tourism

A Caribbean Conference on sustainable tourism was convened at Punta Cana Beach Resort, Dominican Republic, 29 November-2 December 1995. The conference was organized by the Earth Pledge Foundation and co-sponsored by the UN Department for Policy Coordination and Sustainable Development and UNEP. Among the topics explored, particularly as they relate to small island tourist destinations in the Caribbean, were:

- building sustainable infrastructures: energy, water, waste and construction materials;
- financing mechanisms to encourage sustainable tourism – balancing the public and private sectors' participation in coastal resources management;
- balancing tourist satisfaction, community involvement and employee concerns, investor rewards and environmental protection;
- sustainable tourism initiatives and future orientations.

For more information, please contact: The Earth Pledge Foundation, 485 Madison Square, 24th fl., New York, NY 10022, USA. Fax: +1 (212) 758-0832. ◆

IHA Award "Green Hotelier of the Year"

UNEP IE helped the International Hotel Association to choose "Green Hoteliers of the Year", the theme of their environmental award for 1995. The winners, selected from over 67 submissions, demonstrated personal leadership in implementing comprehensive environmental programmes with a cost-benefit analysis component, continuous improvement, and a willingness to share best practices. For the first time the award was shared by a corporate and an independent hotelier.

For more information, please contact: The International Hotel Association, 80, rue de la Roquette, 75544, Paris Cedex 11 France. Fax: +33 (1) 47 00 84 55. ◆

Eastern and Southern African Countries

The UNEP Regional Office for Africa organized a workshop on "The Cleaner and Safer Production for Eastern and Southern African Countries" 21-24 November 1995, with the technical support of UNEP Industry and Environment. In a session devoted to tourism, discussions focused on the role and potential of tourism in the countries represented, the environmental problems encountered (particularly sea pollution) due to poorly managed tourism, and the need for information and tools to better develop and manage tourism in the region.

For more information, please contact: UNEP ROA, P.O. Box 30552, Nairobi, Kenya. Fax: +254 (2) 226 886. ◆

Publications

Agenda 21 for the Travel and Tourism Industry – Towards Environmentally Sustainable Development

This report, jointly published by the World Travel and Tourism Council (WTTC), the World Tourism Organization (WTO) and the Earth Council, translates Agenda 21 into a programme of action for the travel and tourism industries. Part 1 contains a summary of Agenda 21 and addresses what the travel and tourism industries could do to achieve the aims of the Agenda. Part 2 defines and details nine priority action areas for government departments, national tourist administrations and trade organizations, and ten priority action areas for the private sector.

For more information, please contact: WTTC, 20 Grosvenor Place, London SW1X 7TT, UK. Fax: +44 (171) 222 4983; WTO, Capitan Haya 42, 28020 Madrid, Spain, Fax: +34 (1) 571 3733. ◆

Tourism and the Environment in European Countries

Published by the Council of Europe for the Ministerial Conference "Environment for Europe" held in Sofia, Bulgaria, 23-25 October 1995, this report reviews the development of tourism in 23 countries in Europe. Each national case study details the negative environmental impacts of tourism and the actions being taken to mitigate these impacts. The appendix contains the recommendations on the General Policy for Sustainable and Environmentally-Friendly Tourism Development adopted by the Committee of Ministers on 5 September 1994.

For more information, please contact: Secretariat of the Environment and Conservation Division, Direction of Environment and Local Authorities, Council of Europe, BP 431 R6, F 67006 Strasbourg Cedex, France. Fax: +33 (16) 88 41 27 81/82/83. ◆

World News

New Zealand follows Canadian lead on voluntary agreements to reduce CO_2 emissions

The Canadian experience with the Voluntary Challenge and Registry (VCR) programme has been an inspiration to legislators in New Zealand. Under the VCR programme greenhouse gas emitters voluntarily register their intention to cut emissions. Approved by the Canadian Energy and Environment Ministers in 1995, the scheme has already established a very wide participation base of significant emitters, with between 80 and 100 per cent of energy producers and companies from almost all sectors reporting to the Registry.

In a similar fashion, nine major industrial concerns in New Zealand recently signed voluntary agreements with the Minister of Energy, representing the New Zealand government, on stabilizing of net CO_2 emissions at 1990 levels by the year 2000.

In July 1994 New Zealand's Minister for the Environment announced that the New Zealand government was to use voluntary agreements with industry as a major element of policy on reducing CO_2 emissions. Following this policy decision, a Technical Working Group was set up with members from industry, government departments and the Energy Efficiency and Conservation Authority. The Technical Working Group's most important tasks were to provide the basic framework for voluntary agreements and to provide methods for the assessment of savings. For example, percentage reduction could be based on CO_2 emitted per unit of production (tonne of steel, tonne of cement, etc., depending on the industry in question). The New Zealand authorities acknowledge the usefulness of the Canadian experience in the development of these methods, in particular the model defining a 2000 base year equivalent. The agreements are explicitly not legally binding and there are no penalties for failing to achieve targets, which are set by the companies themselves. There is a wide variety of expected savings from sector to sector (as shown in the table above) and evidence suggests that, in general, companies have been conservative in their savings estimates.

After the signing, New Zealand's Prime Minister, Jim Bolger, said that the total savings made by the companies would amount to almost two million tonnes of carbon dioxide per year not being discharged into the atmosphere.

Expected savings in CO_2 emissions per sector in New Zealand

	% savings in CO_2 per unit of production by 2000	Estimated tonnes of CO_2 saved per annum by 2000
Industry		
ACI New Zealand Glass Manufacturers	16.5%	11,500
BHP New Zealand Steel	13.2%	284,000
Carter Holt Harvey	45.8%	433,000
The cement industry	12.0%	130,000
Comalco New Zealand	4.0%	29,000
Petrochem	28.0%	64,000
Winstone Wallboards	21.0%	8,500
Energy Transformation		
Electricity Corporation of New Zealand	not applicable	874,000
Methanex	5.5%	118,000

Negotiations have mainly been concluded with individual companies. Reaching agreements with sector groups has so far proved to be a longer process. It is hoped that in the future an increasing number of agreements will be signed with groups combining all of the companies in a common sector.

Further information is available in "Technical Guidelines", obtainable from the Ministry of Commerce, P.O. Box 1473, Wellington, New Zealand. ◆

Costa Rica – sustainability in practice

Under the guidance of its President José Maria Figueres, Costa Rica has embarked on a programme of sustainable development which will serve as a showcase and an example to other nations. The basis of the plan is to raise revenue from sustainable use of the country's resources combined with firm commitments on energy.

The President intends to double the size of Costa Rica's national parks and has created a commission with the task of setting boundaries. National Parks will ultimately cover a quarter of the country. Increased national parks would of course benefit tourism, which has already overtaken bananas as the country's major source of earnings. However, the programme does not just aim to develop this one industry. The National Institute of Biology (INBio), set up in 1989, is charged with the task of cataloging organisms found in Costa Rica and "renting" them to potential users. The extent of the resource is considerable, with an estimated 333,000 species present in the 423 square mile Guanacaste Conservation Area. The programme has already produced significant results as INBio has signed the first contract ever for royalties from a country's biodiversity. The contract is with the pharmaceutical giant Merck and Co. for supply of 10,000 biological samples and is worth 1.14 million dollars. In addition to the Merck contract, INBio has also extracted a natural pesticide harmless to humans and other mammals from a native tree and has recently signed a contract with the British Technology Group, which holds the patent. In return, INBio has an exclusive license for production and sales in Costa Rica. The trees supplying the substance will be grown on an area of around 1000 acres, creating jobs for local people.

Further revenue is gained from setting aside of forest for carbon storage under agreements with power producers using this as a way of meeting their obligations to offset greenhouse gas emissions.

Costa Rica has also introduced a carbon tax, a 15 per cent tax on oil and gasoline which will be used directly to fund growing of trees by small farmers to act as carbon sinks.

A new electricity tax has been brought in to ensure that electricity prices reflect the true environmental cost of production, and as part of a

UNECE publishes guidelines on access to environmental information

Principle 10 of the Rio Declaration on Environment and Development states that "Environmental issues are best handled with the participation of all concerned citizens at the relevant level." As a step towards giving concrete form to this statement of intention, the United Nations Economic Commission for Europe (UNECE) has just published a set of "Guidelines on Public Participation in Environmental Decision-Making." The Guidelines are published in three languages, French, Russian and English and have two main sections. The first is a clear statement of the rights of all individuals and bodies to have access to environmental information right across the board. The second section, entitled "Public Participation", gives recommendations to countries designed to facilitate involvement of interested parties, particularly NGOs. Two other sections deal briefly with administrative and legal aspects and with implementation of the guidelines. The booklet is available from bookstores and distributors or from the United Nations Sales Section in either New York or Geneva.

For further information, contact: Environment and Human Settlements Division, ECE, Palais des Nations, 1211 Geneva 10, Switzerland. Tel: (41 22) 917 23 45, Fax: (41 22) 907 01 07.

Sustainable America – report and highlights summary from the President's Council On Sustainable Development

President Clinton's Council on Sustainable Development, set up in 1993, has published its report and a Highlights summary. Council members were selected by the President who appointed 25 leaders from business, government, environmental, civil rights and Native American organizations. The President nominated Mr. Buzzelli, Vice President of DOW Chemicals, and Mr. Lash from WRI to head the council creating a partnership and a platform for consensus between industry and NGOs. The Council then created eight Task Forces involving more than 450 experts. The range of areas covered by the Council's activities was accordingly extremely wide. From the conceptual point of view, the Council stresses the need for a new way of thinking which encompasses the link between environmental and social equity issues. This is expressed in the Council's belief that if sustainability is to be attained, "things such as jobs, productivity, wages, knowledge and education should grow but that pollution, waste and poverty should not." The Council also places great importance on individual and community efforts as evidenced by the organization of more than 50 public meetings and many informal events over a two-year period. The Council's report gives 154 specific actions required to apply 38 major recommendations on a range of issues including economic and regulatory policy, management of natural resources, education and international policy.

Both the text of the report and the Highlights summary are available on Internet at http://www.whitehouse.gov/PCSDa.

move to internalize certain costs to ensure that the polluter pays.

The President's energy policy is equally far-reaching, with an eventual goal of 98 per cent from renewables by 2000. As an illustration, a planned fossil fuel plant recently failed to obtain the go-ahead in favour of a geothermal station. Such actions are coupled with a Rational Use of Energy Act aiming to reduce the present 9 per cent annual increase in electricity demand by two points.

When dealing with proposed internal investment, the Costa Rican government balances the needs of industrial development and protection of the environment. A proposed paper mill likely to pollute an environmentally sensitive area was refused permission. However the project was directed elsewhere and help was extended to the company in obtaining permits.

The success of such projects, combined with educational activities, is now convincing initially skeptical Costa Ricans of the possibilities of sustainable development. ◆

OECD ministers meet for 25th anniversary of Environment policy committee

Environment Ministers from OECD countries and the European Environment Commissioner met on 19-20 February 1996 to mark the 25th anniversary of the OECD Environment Policy Committee. The presence of Ms Elizabeth Dowdeswell, the Executive Director of UNEP, gave an additional global dimension to the proceedings. Ministers used the occasion to review developments in environmental policy over the last 25 years, to plan common actions for present-day problems, and to look to the future.

Ministers agreed that the most prominent change since their last meeting had been "globalization" and that, with the world moving towards the "global village", both the scale and effect of environmental problems are also becoming global. However, globalization was not seen by Ministers as merely being a challenge for environmental management. Increased interdependence at all levels could be a powerful motor in the move towards worldwide sustainable development.

Discussions were extremely wide ranging, addressing many major issues both relating to environmental problems and future actions for sustainability. A small sample of the subjects discussed: Climate Change, Ozone Depletion, Loss of Biodiversity, Desertification and Land Degradation, Energy, Trade, and Funding.

Regarding the future, the meeting recognized the need for long-term commitments both to solve present problems and to address those which may yet emerge. The Ministers re-stated the need for environmental questions to be given top priority on the international agenda, and stressed the need for international action to solve global environmental problems. Importance was given to the integration of environmental issues in economic planning and to transfer of technology and know-how to both OECD and non-OECD countries.

The need to produce demonstrable "value for money" results was affirmed. It was pointed out that environmental policies had not reduced employment in OECD member countries. In fact, there is some indication that such policies may even be positive in terms of job creation. Moreover, OECD studies and those from other bodies confirm that environmental policies do not significantly impact industrial competitiveness or trade, nor do they encourage industries to relocate in countries with lower environmental standards.

Ministers expressed satisfaction regarding the exchange of views prior to the meeting with the OECD's Business and Industry Advisory Committee, its Trade Union Advisory Committee and several non-governmental organizations, which they viewed as "highly constructive". The proposed idea of NGOs forming an environmental advisory committee to the OECD was also warmly received.

Regarding policy planning, Ministers affirmed their belief that the Polluter Pays and Precautionary Principles were the best basis for future environmental policies and instruments.

The meeting welcomed the constructive dialogue which has recently been established, both in OECD and non-OECD countries, on the question of sustainable consumption and production patterns supporting sustainable development objectives. This indicates a move towards consumption-based strategies, which will be necessary to prevent the gains from better pollution control and resource-per-unit-output measures being overtaken by increased consumer demand. Ministers also viewed the related strategy of eco-efficiency, which covers concepts similar to those in UNEP's Cleaner Production Programme approach, as a highly promising way of decoupling pollutant release and resource use from economic activity.

An agenda for action from the "Towards Corporate Environmental Excellence" Conference

The "Towards Corporate Environmental Excellence Conference" (announced in the October-December 1994 issue of *Industry and Environment*) was held in Kuala Lumpur, on 17-20 October 1995. Ms Elizabeth Dowdeswell, UNEP's Executive Director, addressed the conference, which was called to reflect on five clear objectives: to promote the role of business in achieving sustainable development, to encourage the corporate sector to be proactive in addressing environmental challenges of common concern, to enhance business opportunities through green management policy and practices, to foster cooperation between businesses and the public for the betterment of the environment, and to set an agenda for corporate environmental excellence.

The Conference's conclusions took the form of an Agenda for Action in which the principles for sustainable development are grouped under three headings:

- the development of a corporate policy for environmental excellence;
- the application of environmentally sound management and operational practices;
- the adoption of a wider role by business to promote sustainable development in the community.

Further information can be obtained by contacting Mr Teoh Cheng Hai, G500f Conference Organising Chairman, c/o Golden Hope Plantations Berhad, P.O. Box 11043, 50734 Kuala Lumpur, Malaysia.

On the question of chemical hazards, Ministers affirmed their support for a global plan of action to deal with problems such as persistent organic pollutants. Support was also expressed for a concerted approach to the movement of hazardous substances and, endorsement given both to the negotiations for a convention on Prior Informed Consent and to moves to open access to the Mutual Acceptance of Data in the Assessment of Chemicals to non-member counties.

In discussing policy tools, Ministers recognized the need for continuing review and improvement as well as welcoming increased use of voluntary or negotiated agreements between government and industry. Spatial and urban planning, it was also agreed, is an important tool in dealing with long-term environmental pressures.

UNEP IE's E-mail address: unepie@unep.fr

As use of energy and natural resources in non-OECD countries is likely to be greater than in member countries shortly after the year 2000, it was considered important that the OECD should increasingly concern itself with the environment in Central and Eastern Europe and in the former Soviet Union, as well as in other areas where economic development is dynamic and rapid. Since the last such meeting, Mexico and the Czech Republic have joined the OECD, this was welcomed and the hope was expressed that present negotiations with Hungary, Korea and Poland will lead to positive results.

Finally, the meeting considered the role of the OECD and urged:

- a thorough assessment of the relationships between globalization and environmental policies,
- wide-ranging analysis of the effects of subsidies and tax disincentives, and
- further examination of the potential for "green" tax reforms.

The Ministers agreed that another meeting should be held at the OECD in 1998, to take place after the Special Session of the UN General Assembly to review progress since the Rio Conference on Environment and Development.

For further information, contact OECD Communications Division, 2 rue André-Pascal, 75775 Paris, Cedex 16, France. Tel: +33 (1) 45 24 80 89, Fax: +33 (1) 45 24 80 03. ◆

Industry Updates

The automobile industry – changes in rules concerning vehicle emissions in several countries

Canada

Stricter measures on vehicle emissions in British Columbia

The Canadian province of British Columbia recently decided to model its legislation on the strict limitations in place in California. According to the Minister for Health, the aim of this move is to reduce the pollution level by 50 per cent by 2010 and by 70 per cent by 2020 in the densely populated areas of the south-west of the province.

The Minister for the Environment, Moe Sihota, said that although automobile manufacturers would have preferred voluntary agreements, the pressing nature of the problem meant that legislation was a more appropriate means.

Briefly, the programme is as follows:

- All vehicles registered after 1998 will have to meet US standards, which are more stringent than the existing Canadian ones;
- Vehicles registered from 2001 will have to meet Californian standards;
- Manufacturers had until February 1996 to identify the reductions they think possible for vehicles sold between 1997 and 2000;
- Percentages for ZEV/ULEV (zero-emission and ultra-low-emission vehicles) identical to those adopted in California;
- Guarantees on general compliance with anti-pollution standards over 35,000 kilometres or two years and over 120,000 kilometres or eight years for major components like the catalytic converter.

Mexico

Emergency measures in Mexico

A plan for better control of winter pollution in Mexico City was announced in November 1995. It is in the winter that the phenomenon of thermal inversion, which causes accumulation of pollution in the Mexico City valley, occurs most frequently. The plan will come into action when the Metropolitan Air Quality Index (Imeca) is between 250 and 350 points. The acceptable Imeca level is less than 100 points.

Under the plan there will be an extension of the "day without a car" programme with rotation based on license plates. Polluting industrial installations will have to reduce production by 30 to 40 per cent, whereas factories controlling their pollution will be allowed to run at full capacity. Other measures include temporary closure of service stations not equipped for vapour recovery, removal of vehicles registered before 1985 parked in the street, suspension of road repair work holding up traffic, and a reduction in output from electricity generating facilities of up to 50 per cent.

USA

Relaxation of ZEV (zero-emission vehicle) mandate in California

As expected, the California Air Resources Board (CARB) has reached an agreement with automobile manufacturers to significantly reduce obligations concerning ZEVs (Zero-Emission Vehicles). The industry undertook to continue to strive to produce, sell and promote ZEVs, but there will be no quantified requirements until 2003.

Two major consequences of this decision are:

- Since manufacturers will have to meet unchanged NMOG objectives, they will have to sell more ULEVs (ultra-low-emission vehicles) to compensate for the losses caused by any drop in sales of ZEVs.
- Manufacturers have undertaken to sell cars meeting the requirements of the 49-State Fed LEV programme across the rest of the country from 2001 onwards. Vehicles meeting the requirements of this programme and migrating into California will therefore offset the loss of envrionmental benefit from not selling ZEVs in the initial years.

Ban on leaded fuels come into force in USA

The modifications made in 1990 to the Clean Air Act included the banning of the sale of automobile fuels containing lead or lead additives after 31 December 1995. The EPA has issued a new regulation, coming into effect on 1 January 1996, which specifies that no fuel may contain more than 0.05 g of lead per gallon. This limit is equal to that which has been in force for several years for fuels qualified as "lead free". The new regulation also does away with certain obliga-

tions on manufacturers judged no longer relevant.

Higher speed = higher pollution according to EPA

President Clinton has accepted a law removing the requirement for speed limits of 55/65 mph in order to qualify for financial aid in the building of highways. These limits were originally established at the time of the OPEC embargo in 1973.

Withdrawal of these limits will have negative effects with regard to emissions of some pollutants. Nitrogen oxides, which are precursors to the formation of ozone, increase as soon as speed goes beyond 48 mph. The EPA's MOBIL 5 model forecasts a 5 per cent increase in NO_x with a hypothetical unchanged speed limit in urban areas and limits raised to 65 mph in rural zones.

Both CO and CO_2 will also increase. The EPA estimates that the increase will be between 6 and 15 per cent of the volume required to return US emissions to 1990 levels in the year 2000.

Europe

Europe's Environment Ministers agree on common standards for light trucks

The European Council of Environment Ministers has reached agreement on common emissions standards for light trucks. The Council's position differs slightly from an original proposed Commission directive in that it delays application by nine months and makes the standards a little more severe. The new standards still have to be approved by the European Parliament.

The standards would remain in force until the year 2000, at which point an overall review of the EU's approach to vehicle pollution is expected.

Table 1 shows the values proposed (in grams per kilometre) and their application dates.

Table I
EU Council agreed standards for light truck emissions (g/km)

Class of vehicle	Fuel	CO	HC+NOx	PM*	Date of application
Class 1 (less than 1250 kg)	All	2.72	0.97	0.14	10/1/93 10/1/94
"	Gasoline	2.2	0.5	-	10/1/97
"	Diesel IDI	1.0	0.7	0.08	10/1/97
"	Diesel DI	1.0	0.9	0.10	10/1/97
"	Diesel DI	1.0	0.7	0.08	10/1/99
Class 2 (1251 to 1700 kg)	All	5.17	1.40	0.19	10/1/93 10/1/94
"	Gasoline	4.0	0.6	-	10/1/98
"	Diesel IDI	1.25	1.0	0.12	10/1/98
"	Diesel DI	1.25	1.3	0.14	10/1/98
"	Diesel DI	1.25	1.1	0.14	10/1/99
Class 3 (more than 1700 kg)	All	6.9	1.7	0.25	10/1/93 10/1/94
"	Gasoline	5.0	0.7	-	10/1/98
"	Diesel IDI	1.5	1.2	0.17	10/1/98
"	Diesel DI	1.5	1.6	0.20	10/1/98
"	Diesel DI	1.5	1.3	0.20	10/1/99

* Diesel vehicles only

Sweden

Restrictions on movements of heavy duty vehicles in Swedish towns

From 1 April 1996 new heavy duty vehicles driven in Stockholm, Göteborg and Malmö will have to satisfy Euro2 standards to be allowed into the most polluted central areas. Exception is made for vehicles less than eight years old. For vehicles older than eight years, admission is subject to their being retrofitted with a kit specially designed for the purpose. There are two categories of kit. These are shown in Table 2 which also shows the expected effects of the kits on emissions.

Kit B is for all vehicles from 1986 and before. However, owners of vehicles from 1986 and 1987 can choose between the two kits. In 1998 this will be extended to 1988 and 1989 vehicles. In 1996 all vehicles registered in 1980 or before will be banned. The ban will move forward progressively year by year.

Table II
Retrofit kits A and B for Swedish heavy duty vehicles

Pollutant	Type A	Type B
Particulate	-20%	-80%
Hydrocrabons	-60%	-60%
NOx	No increase	No increase
Noise	No increase	No increase

Japan

More severe standards on diesel in Japan

Air quality is considered unsatisfactory in Japan's large cities, with problems primarily being caused by emissions such as nitrogen oxides (NO_x). The Minister of Transport is to propose a modification to the law on vehicles to address the problems of NOx, particulates, and smoke from diesel vehicles. This modification will be based on long-term values proposed in December 1989 by the Central Council for Environmental Pollution Control.

The Ministry of Transport informed the World Trade Organization, as required by the Agreement on Technical Barriers to Trade. The targeted application dates are October 1997 and 1998 for the different classes of Japanese vehicles and April 2000 for imported vehicles. The results expected from this legislation are a reduction of 10 to 46 per cent for NO_x, 60 to 64 per cent for particulates and 38 per cent for smoke. ◆

UNEP Focus

Three scientists win 1995 UNEP Sasakawa Environment Prize

The winners of the 1995 UNEP Sasakawa Environment Prize were announced on 28 February 1996. Dr Peter Raven, Director of the Missouri Botanical Garden, and British scientist Dr Norman Myers shared one half of the US$ 200,000 prize for their work over nearly three decades to investigate and document the decline of tropical forests and the worldwide loss of biodiversity. Sri Lankan scientist Dr Canaganayagan Suriyakumaran was awarded the other half of the prize for his pioneering work in the environmental field, including work to foster concepts of multisectoral responses to environmental challenges.

The UNEP Sasakawa Environment Prize was established in 1984, with an endowment from Ryoichi Sasakawa, founder and Chairman of the Japan-based Sasakawa Foundation. It is intended to recognize outstanding contributions to advancing environmental protection at the global level. Past winners have included Mr Lester Brown of the US-based Worldwatch Institute, Indian scientist Dr M.S. Swaminathan and assassinated Brazilian environmental rights campaigner Chico Mendes. Prize winners are selected by a distinguished panel of international leaders and environmentalists, including: Dr Pastrana Borrero, former President of Colombia; Princess Chulabhorn of Thailand; Dr Russell Peterson, President Emeritus of the National Audubon Society; Lord Clinton-Davis, Life Peer of the UK House of Lords; Professor Wangari Maathai, founder and Director of the Kenyan Greenbelt Movement; and Dr Abdulbar Al-Gain, President of the Meteorology and Environmental Protection Administration of Saudi Arabia.

For more information (and to obtain 1996 nomination forms), contact Mr Terry Collins, Senior Information Officer, UNEP, DC2-0803 Two UN Plaza, New York, NY 10017, USA. Tel: +1 (212) 963 8098, Fax: +1 (212) 963 7341, E-mail: collinst@un.org. ◆

Good progress achieved on global hazardous chemicals and pesticides negociations

In March 1996, governments moved closer to an international agreement on extremely dangerous chemicals and pesticides. Some 80 governments attended a negotiating session in Brussels.

"The good progress made at this meeting demonstrates that governments are awake to the importance of safe chemicals management," said Mrs Maria Celina de Azevedo Rodrigues, the Brazilian diplomat who was elected to the Chair. "The final results of our work will be vital to protecting human health and the environment from chemical and pesticide hazards."

The concern of governments was demonstrated by the speed with which the meeting identified issues that could ultimately form part of the agreement. Once concluded, the agreement will help countries that are importing and using hazardous chemicals and pesticides to make better decisions about how to manage them. It will also ensure that these toxic chemicals and pesticides are not exported to countries whose governments decide they do not want them.

Chemical hazards have gained greater public attention due to the dramatic increase in chemicals production and trade since the 1960s. Substances such as asbestos – which is still exported around the world – are now known to be carcinogenic.

Many other chemicals and pesticides are harmful to humans, animals, and entire ecosystems. They can enter the food chain and then gradually accumulate in the vital organs, leading to cancer, birth defects, and other health problems.

Efforts by the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization of the United Nations (FAO) to promote chemical safety were initially based on the 1985 International Code of Conduct on the Distribution and Use of Pesticides and the 1987 London Guidelines for the Exchange of Information on Chemicals in International Trade. Among other benefits, these two voluntary systems encourage governments to share information amongst themselves and to shift to ecologically sustainable chemicals management.

As some pesticides and other chemicals that are banned or severely restricted in certain developed countries are still widely used elsewhere, particularly in developing countries, the governing bodies of FAO and of UNEP introduced the voluntary "Prior Informed Consent" procedure (PIC) in 1989.

This procedure helps importing countries learn more about the characteristics of the hazardous chemicals that may be shipped to them, and allows them to make decisions about future imports of these chemicals. Exporting countries are then notified which products the importing countries no longer want to receive and can take measures to ensure that illegal exports do not occur.

As of 1 March 1996, 145 countries are participating in the voluntary PIC procedure, which is implemented by the FAO/UNEP Joint Programme on the operation of the PIC procedure. The negotiations held in March were aimed at making the existing voluntary procedure mandatory and more widely applied by transforming it into a legally binding instrument.

For more information, please contact Michael Williams, UNEP (Geneva). Tel: +41 (22) 979 9242, Fax: +41 (22) 797 3464, E-mail: mwilliams@unep.ch. Official documents for the meeting are available on the World Wide Web at http://irptc.unep.ch/pic/ ◆

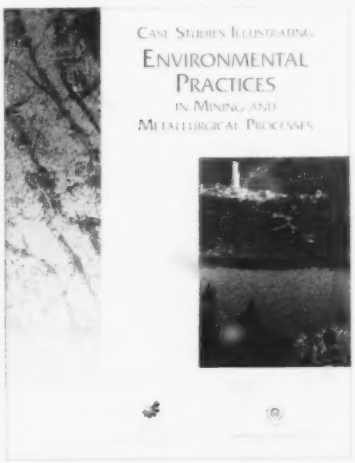
Case Studies Illustrating Environmental Practices in Mining and Metallurgical Processes

Prepared in cooperation with the International Council on Metals and the Environment (ICME), the 61-page compilation of 29 case studies illustrates how good environmental performance is achieved through a combination of sound procedures and good management, operating in a clear regulatory framework.

The case studies include examples of environmental management systems, project approval procedures, regulatory development, good operations and techniques, training and education. They cover the main elements of the mining cycle, i.e. exploration, mining, primary metals processing, recycling, rehabilitation and closure.

Examples are given of innovative approaches that can be used in countries other than those mentioned. They explain what was done, and the results achieved.

This publication provides useful information for a range of readers in industry and government. It is especially intended to motivate decision-makers by demonstrating what has been achieved elsewhere. However, it is not a technical manual, and for detailed information the reader is advised to follow up directly with the case studies' authors, whose names are provided.



Case Studies Illustrating Environmental Practices in Mining and Metallurgical Processes (1996). UNEP and ICME. Pbk, 61 p. ISBN 92-807-1558-5. Available from UNEP IE. ◆

New UNEP Directors

The appointment of two new UNEP Activity Centre Directors was announced by Executive Director Elizabeth Dowdeswell on 18 December 1995. Ms Terttu Melvasalo of Finland was appointed as Director of the UNEP Oceans and Coastal Areas Programme Activity Centre (OCA/PAC), which is based at UNEP headquarters in Nairobi, Kenya. Mr Makram Amin Gerges of Egypt, who had been officer-in-charge of OCA/PAC for one year, was appointed Director of UNEP's Regional Office for West Asia (ROWA), based in Manama, Bahrain.

As Director of OCA/PAC, Ms Melvasalo will be responsible for a programme that encompasses 13 Regional Seas Programmes worldwide, all with Action Plans approved by intergovernmental meetings, many based on legally binding conventions. OCA/PAC has as its main objective the protection and management of the marine environment and coastal areas, including living resources. It places a special emphasis on small island developing states, land-based human activities and pollution, marine mammals, and climate change-induced sea-level rise.

ROWA is one of the five Regional Offices of UNEP, which are being strengthened to make UNEP more responsive to the specific needs of the governments of the various regions and to enhance regional delivery of the products of UNEP's work. ROWA's new Director, Mr Gerges, joined the UN in 1981. In 1991, he was appointed Deputy Director of OCA/PAC and was Officer-in-Charge during 1995. Mr Gerges has been instrumental in fostering cooperation among the countries of West Asia, particularly in the area of marine environmental protection and coastal area management, notably through leading the UN Inter-Agency Plan of Action which addressed the environmental consequences of the 1991 Gulf War.

For further information, contact OAC/PAC, UNEP, P.O. Box 30552, Nairobi, Kenya. Tel: +254 (2) 622 613, Fax: +254 (2) 622 788; ROWA, UNEP, Manama, Bahrain. Tel: +973 276 072, Fax: +973 276 075.

UNEP IE activity summary

UNEP IE works on a wide range of issues through several distinct Programmes. Here we present summary details of UNEP IE activities in the first quarter of 1996. A number of the Programmes produce their own quarterly or biannual newsletter, describing their work in more detail. For more information on all activities mentioned, contact UNEP IE.

Awareness and Preparedness for Emergencies at Local Level (APELL) Programme

- An APELL Senior Industry Consultant took part in a workshop on training approaches for environmental management in industry, organized by UNEP's Regional Office for Latin America and the Caribbean and held on 22-26 January.
- An APELL Seminar/Workshop was held in Zulia-El Tablazo, Venezuela, on 31 January-1 February.
- A meeting was held with the Organisation for Economic Co-operation and Development (OECD) on 6 February to discuss further cooperation between APELL and the OECD Chemical Accidents Programme.
- An APELL representative visited the US Environmental Protection Agency and US Chemical Manufacturers' Association in Washington, D.C. on 7-8 February to discuss cooperation.
- An APELL Seminar/Workshop was held in Puerto La Cruz, Venezuela, on 26-29 February.
- A pre-APELL assessment meeting with firefighters was held in Puerto Piritu, Venezuela, on 1 March.
- An APELL Seminar/Workshop was held in Bahia Blanca, Argentina, on 12-15 March.
- An APELL representative made a presentation to the International Affairs Committee of the US Chemical Manufacturers' Association in Washington, D.C. on 19 March.
- An APELL Seminar/Workshop was held in Kyang-Ju, Korea, on 25-29 March.

The biannual APELL Newsletter is available in English, French and Spanish and is a free of charge supplement to ***Industry and Environment****.*

Cleaner Production (CP) Programme

- Work continued in the context of the CP Programme's project in China, including a mission to that country beginning on 8 January; a meeting with the China Ministry of Chemical Industry on 15 January; and a contribution to the US bilateral project on pollution prevention in China on 16-19 January.
- A draft document entitled *Information on Cleaner Production: A Guide to Sources*, was completed in January. The document contains contacts for cleaner production centres and activities, UNEP publications, data bases, journals and newsletters.
- Preparations continued for the 4th biannual High-Level Advisory Seminar on Cleaner Production, to be held in Oxford, UK on 23-26 September. These included a meeting with core advisors on 15 January and a visit to Oxford on 30 January to meet conference organizers.
- Members of the CP Programme met with a representative of EMPA, Colombia, on 28 February to discuss the establishment of a National Cleaner Production Centre in Colombia.

The biannual CP Newsletter is published in English, French and Spanish and is a free of charge supplement to ***Industry and Environment****.*

Environmental Technology Assessment (EnTA) Programme

- The Survey of Information Systems on Environmentally Sound Technologies (EST) was completed and presented to the Commission on Sustainable Development (CSD) at its fourth session. This survey identifies 84 EST-related information systems and characterizes each with respect to information contained, information dissemination method, cost and accessibility. It also summarizes the conclusions of the Expert Meeting on Information Systems for Environmentally Sound Technologies that was held in Paris on 9-11 October. The report to the CSD recommends the establishment of an EST Information System Network to facilitate communication between system users and suppliers. A copy of the report to the CSD is available from UNEP IE.
- A draft of the primer on environmental technology assessment entitled *Anticipating the Environmental Effects of Technology: A Primer and Workbook* was completed and is available from UNEP IE. It will be used in EnTA training courses to be offered later this year.

The EnTA Newsletter is a free of charge supplement to ***Industry and Environment****.*

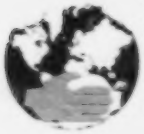
OzonAction Programme

- An OzonAction-organized National Training Course on Good Practices in Refrigeration was held in Ougadougou, Burkina Faso, on 22-25 January. The meeting was held in association with the International Institute of Refrigeration (France).
- The OzonAction Programme hosted a series of meetings on 14-16 February, centred on the 5th Informal Advisory Group Meeting on 16 February at which 1996 Work Programme activities were planned. The other meetings were with Regional Network Coordinators, with Implementing Agencies under the Montreal Protocol and with the Training Strategy Advisory Group.
- The OzonAction Programme organized with the Government of Cameroon a Technology Transfer Workshop on the Practical Implementation of the Montreal Protocol in French Speaking African Countries. The workshop was held in Douala, Cameroon, on 27-29 February.
- Members of the OzonAction Programme participated in the conference on CFC and halon replacement strategies, held in Dubai, United Arab Emirates, on 28-29 February.
- The OzonAction Programme Coordinator participated in the 13th Meeting of the Implementation Committee under the Non-Compliance Procedures of the Montreal Protocol, held in Geneva on 18-19 March.
- A meeting of the South East Asia Pacific Network of ODS Officers was held in Bangkok on 21-22 March.

The OzonAction Newsletter is published quarterly and is available free of charge from the OzonAction Programme at UNEP IE.

Tourism Programme

See page 47 for news of activities of the Tourism Programme.



Global Industrial Management Programme

• A final version of a training kit on environmental management systems was released in January. The kit is published by UNEP IE jointly with the International Chamber of Commerce (ICC) and the International Federation of Consulting Engineers (FIDIC) (see *Industry and Environment* Vol 18, N° 4, p. 65). The kit was subsequently promoted in several international fora, including Globe '96, held in Vancouver, Canada, on 26-29 March.

• A project document on sustainable production was finalized in January. An executive summary of the kit will be available shortly.

• A member of the Programme participated in the Jury Panel to select winners in the European Better Environment Awards for Industry funded by the European Commission.

• Follow-up work on UNEP Technical Report N° 24, *Company Environmental Reporting: A Measure of the Progress of Business and Industry Towards Sustainable Development* is currently underway and will address engaging stakeholders and benchmarking.

Industrial Pollution Management Programme

• Work continued on the preparation of a training manual on mine site rehability, including a visit to UNEP IE by a representative of the World Health Organization regional office for Europe, with which the manual is being jointly planned.

• A forthcoming UNEP Technical Report on soil contamination was finalized on 8 February at a meeting with the French Agence de l'environnement et de la maitrise de l'energie (ADEME). ◆

UNEP Industry and Environment in the regions

UNEP Regional Office for Africa: news round-up for the Africa region

Industry and Environment activities in the Africa region over the period December to June 1995 ranged from awareness raising and capacity building workshops at national and sub-regional levels to regional conferences of ministers of industry and of environment; from lecture seminars to demonstration projects on cleaner production approaches and other industrial environmental management techniques.

Reports from participants in a number of UNEP organized workshops showed that there is now a general awareness at the national level of the potential for environmental degradation resulting from industrial activities. It is also generally recognized that industrial practice and investment in the region must employ the cleaner production approach, accept the use of APELL (Awareness and Preparedness for Emergencies at Local Level), manage the use of chemicals in an environmentally sound manner, and generally embrace the concept of sustainable industrial production and consumption.

The awareness of the need for environmental protection from industrial activities is reflected by, for example, the increasing number of countries in the region which make it a requirement, before government permission is granted, that an environmental impact assessment (EIA) is conducted for new industrial investments. Countries in which an EIA is required for new investments include the Republic of South Africa, Ethiopia, Ghana, Egypt, Nigeria, Botswana, Mauritius, Cameroon, and Uganda. Another indicator is the increasing number of national awareness-raising and capacity-building workshops that were conducted in the region.

Examples of national workshops held in the region include a workshop sponsored by Nigeria's Federal Environmental Protection Agency and the World Bank on Industrial Pollution in Nigeria which took place in May 1995. In Kenya a seminar on Pollutant Release and Transfer Registries from industrial facilities around a national heritage lake site in the country was held in September 1995.

In Francistown, Botswana, a congress sponsored by the government of Botswana and the German Technical Cooperation (GTZ) considered the problem of waste management in the country. UNEP was represented in the congress in order to support the national effort. Similar efforts were made throughout the region.

At the sub-regional level, awareness-raising and capacity-building workshops held include the following:

• A workshop on the sound management of chemicals for countries of Eastern and Southern Africa was held in the Republic of Soth Africa in September 1995, sponsored by UNEP, UNITAR (the United Nations Institute for Training and Research), FAO (the Food and Agriculture Organization), and the European Union. It was well attended by delegates from countries in the sub-region as well as representatives from US EPA.

• In October 1995, another workshop was held in Johannesburg, South Africa, on Mining Environment Legislation. This workshop was sponsored by UNEP, the Southern African Chamber of Mines, and SADC. It was focused on mining legislation in countries forming the Southern African Development Cooperation (SADC) and on various aspects of environmental impact assessment and environmental management at mine sites.

• At UNEP headquarters in Nairobi, a workshop on Cleaner and Safer Industrial Production was held in November 1995 in which countries from the East and South Africa sub-region as well as Ghana, Egypt and Nigeria were represented. Topics covered included cleaner production, APELL, waste management, sustainable tourism, and environmental legislation relevant to industry.

• A three-week seminar on industrial environment management was also held for industrial managers and others in Addis Ababa in November-December 1995.

Considering the more practical aspects of capacity-building in the cleaner production approach, the region has witnessed initiations of demonstration centres in a number of countries. Worthy of note is the National Cleaner Production Centre started in Zimbabwe in July 1995. This centre is funded jointly by UNIDO and UNEP.

The Cleaner Production Centre of Tanzania was initiated in October 1995. It is also funded by UNIDO and UNEP, although UNIDO is the executing agency. In Zambia phase 1 of a cleaner production project being implemented by the Environmental Council of Zambia and the Norwegian Company, Det Norske Veritas Development (DNV), has already been completed. In Egypt a programme on industrial pollution abatement is currently under way. Other countries such as Senegal, Tunisia, and Cameroon show signs of introducing cleaner production centres.

In many countries in the region laws relating to the environmental impact of industrial operations are under scrutiny and are being changed to reflect the new heightened sensitivity to industrial pollution. The Republic of South Africa, Botswana, Ghana, Kenya, Ethiopia, Sudan, Egypt and other countries are involved in this sort of exercise.

1995 ended with the meeting of the African Ministerial Conference on Environment (AMCEN) in Nairobi on 11-15 December. One of the significant decisions reached during this meeting was to endorse cleaner and safer industrial production and consumption programmes, including programmes such as APELL, Cleaner Production, Environmental Technology Assessment, Environmental Impact Assessment and Response, and the management of wastes and toxic chemicals. This outcome, combined with UNEP's 18th Governing Council's decisions on the same programmes, should strengthen the base of both UNEP IE and UNEP IRPTC's work in the Africa region. ◆

Books & Reports

GENERAL

The Earthscan Reader in Sustainable Development

Such a huge number of books, journals and papers have been devoted to defining, assessing and implementing "sustainable development" that students and other readers face information overload. Earthscan alone has published hundreds of essays and books on the subject. Now some of the most authoritative writings have been collected in *The Earthscan Reader in Sustainable Development*.

The contributions span five years of the debate and cover the principal themes: the history of the concept; problems in defining it; issues surrounding it; and national and international policies and schemes to implement it. For ease of use, the essays have been split into key subject areas – such as agriculture, population and the commons – and include practical case studies and examples, together with analyses from a number of different viewpoints from both North and South.

This Earthscan *Reader* provides a unique overview of the subject, as well as the long-awaited basic course material for students of environmental studies, economics, geography, politics, planning and the social sciences.

John Kirkby, Phil O'Keefe & Lloyd Timberlake, eds. (1995). Earthscan Publications Ltd, 120 Pentonville Road, London N1 9JN, UK. Pbk, 371p. ISBN 1-85383-216-2. £14.95 (also available in hbk, at £35.00).

State of the World 1995: A Worldwatch Institute Report on Progress Toward a Sustainable Society

This 12th edition of *State of the World* appears at a time when more and more people are aware of the effects of our rapidly rising population on the earth's support systems. The seemingly sudden collapse of the oceanic fishing economy, the rising expectations of China's 1.2 billion consumers, deforestation of the Indian subcontinent and the increase in refugees around the world all point to a need for understanding the interrelationship of population and environmental forces.

This book opens with a hard look at the economic and social costs of the unsustainable harvesting of the earth's natural resources, from the decimated hardwood forests of the Ivory Coast to the idle fishing fleets of Newfoundland. The Worldwatch teams have also researched and reported the trends that can lead to a more sustainable future. This year's volume covers the welcome growth in the number of global environmental treaties; the growing revolution in the energy industry – from new transport technologies to the shift to hydrogen; and the growing awareness that future economic growth will come from more efficient use of materials. There are also essays on China's economic and environmental future; construction of sustainable buildings; the state of world fisheries; the need to conserve mountain ecosystems and societies; creating a sustainable materials economy; the crisis in refugees; and budgeting for disarmament.

Lester R. Brown and others (1995). Earthscan Publications, 120 Pentonville Road, London N1 9BR, UK. Tel: +44 (171) 278 0433, Fax: 837 6348. Pbk, 255p. ISBN 1-85383-247-2. £12.95.

Yearbook of International Environmental Law: Volume 5 – 1994

Gunther Handl, ed. (1995). Oxford University Press, Walton Street, Oxford OX2 6DP, UK. Hbk, 954p. ISBN 0-19-825913-1.

Economic Instruments: Application to Environmental Problems

J.P. Painuly (1995). Working Paper N° 3, UNEP Collaborating Centre on Energy and Environment, Risø National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark. Tel: +45 (46) 322 288, Fax: 321 999. Pbk, 26p. ISBN 87-550-2103-4.

Mainstreaming the Environment: The World Bank Group and the Environment Since the Rio Earth Summit – Fiscal 1995

(1995). The International Bank for Reconstruction and Development/The World Bank, 1818 H Street, N.W., Washington, D.C. 20433, USA. Pbk, 301p. ISBN 0-8213-3290-2.

A New Species of Trouble: The Human Experience of Modern Disasters

Kai Erikson (1995). W.W. Norton & Company, 500 Fifth Avenue, New York, NY 10110, USA; 10 Coptic Street, London WC1A 1PU, UK. Pbk, 263p. ISBN 0-393-31319-0.

IISD Annual Report 1994-1995

(1995). International Institute for Sustainable Development, 161 Portage Avenue East, 6th Floor, Winnipeg, Manitoba, Canada R3B 0Y4. Tel: +1 (204) 958 7700, Fax: 958 7710, E-mail: reception@iisdpost.iisd.ca; Internet: IISDnet at: http://iisd1.iisd.ca/. Pbk, 20p.

Bankroiling Successes: A Portfolio of Sustainable Development Projects

James N. Barnes and others (1995). Friends of the Earth, The Global Building, 1025 Vermont Avenue, N.W., Suite 300, Washington, D.C. 20005, USA; and National Wildlife Federation, 1400 Sixteenth Street, N.W., Washington, D.C. 20036, USA. Pbk, 109p. ISBN 0-913890-94-4.

Statistics for Environmental Engineers

Paul Mac Berthouex & Linfield C. Brown (1995). CRC Press, 2000 Corporate Boulevard, N.W., Boca Raton, Florida 33431, USA. Hbk, 335p. ISBN 1-56670-031-0.

TRANSPORT

Transport in Transition: Lessons from the History of Energy

Stephen Peake (1994). Earthscan Publications Ltd, 120 Pentonville Road, London N1 9JN, UK; and Royal Institute of International Affairs, 10 St

Industry and Environment at your service

In reviews of books and reports, all available information is included to help readers locate and obtain particular titles. The following points may be helpful:

In the notes at the end of each review, Hbk and Pbk stand for hardback and paperback respectively. Both hardback and paperback versions of some titles are available.

Publishers' telephone, fax, and electronic communication addresses are provided wherever possible. In telephone and fax numbers, the "+" indicates country code. Regional codes (shown here as they would be dialled by international callers) are in parentheses. To save space, international and regional codes are given with just the first telephone or fax number in each book review.

The cost of publications is included wherever possible. Unless otherwise indicated, $ stands for US dollars and £ for UK pounds. Any title with an ISBN (International Standard Book Number) should be available through commercial booksellers. Some publications are available free of charge.

James's Square, London SW1Y 4LE, UK (distributed in North America by the Brookings Institute, 1775 Massachusetts Avenue N.W., Washington, DC 200036-2188, USA). Pbk, 113p. ISBN 1-85383-209-X, £12.95.

ENERGY & CLIMATE

Climatic Change and the Mediterranean

This is the second volume in a series of books recording the results of studies on the impact of climate change on the ecological systems and socio-economic structures of the Mediterranean region.

Incorporating the detailed results of five entirely new case studies (Rhodes, Kastela Bay, Malta, the Syrian coast, and the Cres/Losinj Islands), the book explores the likely effect of climate change on eleven vulnerable sites along the Mediterranean coastline and the available options to avoid, mitigate or adapt to these foreseeable impacts. The regional and site-specific climate scenarios and the methodology used for the analysis of impacts are described, and general conclusions are drawn about the predictable changes on the Mediterranean region as a whole.

Volume 2. L. Jeftic, S. Keckes & J.C. Pernetta, eds. (1995). Arnold, 338 Euston Road, London NW1 3BH, UK. Co-published in the USA by John Wiley and Sons, Inc, 605 Third Avenue, New York, NY 10158-0012, USA. Hbk, 564p. ISBN 0-340-64565-2.

Greenhouse Gas Inventory Workbook

IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2 (1995). UNEP, OECD, IEA and IPCC. IPCC, WGI Technical Support Unit, Hadley Centre, Meteorological Office, London Road, Bracknell RG12 2SY, UK. Binder. ISBN 92-64-14378-5.

Greenhouse Gas Inventory Reference Manual

IPCC Guidelines for National Greenhouse Gas Inventories, Volume 3 (1995). UNEP, OECD, IEA and IPCC. IPCC, WGI Technical Support Unit, Hadley Centre, Meteorological Office, London Road, Bracknell RG12 2SY, UK. Binder. ISBN 92-64-14378-5.

Sustainable Development and the Energy Industries: Implementation and Impacts of Environmental Legislation

Nicola Steen, ed. (1994). Earthscan Publications Ltd, 120 Pentonville Road, London N1 9JN, UK; and Royal Institute of International Affairs, 10 St James's Square, London SW1Y 4LE, UK (distributed in North America by the Brookings Institute, 1775 Massachusetts Avenue N.W., Washington, D.C. 200036-2188, USA). Pbk, 329p. ISBN 1-85383-210-3, £15.95.

Global Climate Change: Economic Dimensions of a Cooperative International Policy Response Beyond 2000

(1995). Australian Bureau of Agricultural and Resource Economics (ABARE), and Department of Foreign Affairs and Trade (DFAT), Federal Government of Australia. ABARE, G.P.O. Box 12, Canberra 2601, Australia. Tel: +61 (6) 272 2000, Fax: 272 2001. DFAT, G.P.O. Box 1563, Canberra 2601, Australia. Tel: +61 (6) 261 9111, Fax: 261 2696. Pbk, 197p. ISBN 0-642-23587-2.

Environmentally Sound Energy Development Strategies for Maharashtra

Jyoti Parikh, J.P Painuly & K. Bhattacharya (1995). Working Paper N° 4. UNEP Collaborating Centre on Energy and Environment, Riso National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark. Tel: +45 (46) 32 22 88, Fax: 32 19 99; Indira Gandhi Institute of Development Research, Gen. Vaidya Marg, Goregaon (E), Bombay 400 065, India. Tel: +91 (22) 840 0919, Fax: 840 2752. Pbk, 40p.

End-use Energy Modelling for Developing Countries: A Review of the End-use Approach for Projecting Long-term Energy Use and GHG Emissions

Jayant A. Sathaye (1995). Working Paper N° 2. UNEP Collaborating Centre on Energy and Environment, Riso National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark. Tel: +45 (46) 322 288, Fax: 321 999. Pbk, 36p. ISBN 87-550-2023-2.

Greenhouse Gas Inventory Reporting Instructions

IPCC Guidelines for National Greenhouse Gas Inventories, Volume 1 (1995). UNEP, OECD, IEA and IPCC. IPCC, WGI Technical Support Unit, Hadley Centre, Meteorological Office, London Road, Bracknell RG12 2SY, UK. Binder, ISBN 92-64-14378-5.

CHEMICALS, POLLUTION & ACCIDENTS

Risk Assessment of Chemicals: An Introduction

The risk management of chemicals represents an international challenge. It occupies a prominent place on Agenda 21, which resulted from the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro in 1992. The development and harmonization of risk assessment methods is a necessary prerequisite to successful risk management.

This book provides an introduction to the risk management of chemicals. It contains basic background information on sources and emissions, distribution and fate processes, toxicology and ecotoxicology, and estimation methods. It describes basic principles and methods for hazard and risk assessment of chemicals in the context of the legislative framework. This introduction contains essential information for students in environmental sciences and those professionally involved in the rapidly developing field of risk assessment and management of chemicals. It also supports the Uniform System for the Evaluation of Substances (USES), a computerized risk assessment system.

C.J. van Leeuwen & J.L.M. Hermens, eds. (1995). Kluwer Academic Publishers, P.O. Box 17, 3300 AA Dordrecht, the Netherlands. Hbk, 374p. ISBN 0-7923-3740-9.

Introduction to Water Pollution Biology

This textbook shows environmental scientists, engineers and students how to examine a water pollution problem and methodically investigate and solve it. It describes the nature and properties of water, and defines water pollution and its categories. The source, pathway, and sink concepts of representative contaminants are stressed.

Practical examples and common situations reinforce a fundamental understanding of the biological effects of pollution. The book focuses on bacteria and algae to show their importance as pollution indicators, as well as their role in natural purification.

Chapters inform the reader about basic environmental concepts related to food webs and contaminant transfer, population dynamics, and the structure of natural ecosystems. For students and professionals who have a background in basic vertebrate and invertebrate zoology and botany, this book broadens their knowledge of the biological effects of water pollution.

Specific types of pollution are addressed, including representative types of contamination scenarios. With this book, the reader can identify typical or expected patterns associated with water pollution and the potential effects on the biotic and abiotic components of the ecosystem.

Richard J. Schmitz (1996). Gulf Publishing Company, Book Division, P.O. Box 2608, Houston, Texas 77252-2608, USA. Hbk, 320p. ISBN 0-88415-927-2.

Description and Sampling of Contaminated Soils: A Field Guide

This revised and significantly expanded guide contains numerous checklists, tables, and step-by-step descriptions of methods and procedures for cost-effective, detailed site investigations for evaluating the potential for contaminant trans-

port, and field collection of information on soil engineering properties required for remediation selection and design.

2nd edition. J. Russell Boulding (1994). CRC Press, 2000 Corporate Boulevard, N.W., Boca Raton, Florida 33431, USA. Hbk, 230p. ISBN 0-56670-050-7.

Toxics and Health: The Potential Long-Term Effects of Industrial Activity

Cheryl Simon Silver & Dale S. Rothman (1995). The World Resources Institute. Pbk, 59p. ISBN 0-1-56973-027-X. $16.95 including shipping and handling. Available from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21211, USA. Tel: +1 (410) 516 6963.

Report of the OECD Workshop on Small and Medium-sized Enterprises in Relation to Chemical Accident Prevention, Preparedness and Response

(1995). Organisation for Economic Co-operation and Development, 2 rue André-Pascal, 75775 Paris Cedex 16, France. Fax: +33 (1) 45 24 16 75. Pbk, 80p. OECD Environment Monograph N° 95, ref: OCDE/GD(95)130. Free of charge.

Environmental Toxicology Assessment

Mervyn Richardson, ed. (1995). Taylor & Francis, 4 John Street, London WC1N 2ET, UK; 1900 Frost Road, Suite 101, Bristol, PA 19007, USA. Hbk, 438p. ISBN 0-7484-0305-1. £95.00.

Risk Communication: A Handbook for Communicating Environmental, Safety and Health Risks

Regina Lundgren (1994). Bettelle Press, 505 King Avenue, Columbus, Ohio 43201-2693, USA. Tel: +1 (614) 424 6393, Fax: 424 3819. Pbk, 175p. ISBN 0-935470-76-X.

Field Sampling Methods for Remedial Investigations

Mark E. Byrnes (1995). CRC Press, 2000 Corporate Boulevard, N.W., Boca Raton, Florida 33431, USA. Hbk, 254p. ISBN 0-87371-698-1.

Assessment and Remediation of Petroleum Contaminated Sites

G. Mattney Cole (1994). CRC Press, 2000 Corporate Boulevard, N.W., Boca Raton, Florida 33431, USA. Hbk, 360p. ISBN 0-87371-824-0.

Passive and Active Sampling Methodologies for Measurement of Air Quality

GEMS/AIR Methodology Review Handbook Series, Volume 4 (1994). UNEP and WHO: UNEP Global Environment Monitoring System, Environmental Assessment Programme, P.O. Box 30552, Nairobi Kenya; World Health Organization, Division of Operational Support, Urban Environmental Health, CH-1211 Geneva 27, Switzerland. Pbk, 80p. Refs: WHO/EOS/94.4, UNEP/GEMS/94.A.5.

City Air Quality Trends: GEMS/AIR Data

GEMS/AIR Methodology Review Handbook Series, Volume 3 (1995). UNEP and WHO: UNEP Global Environment Monitoring System, Environmental Assessment Programme, P.O. Box 30552, Nairobi Kenya; World Health Organization, Division of Operational Support, Urban Environmental Health, CH-1211 Geneva 27, Switzerland. Pbk, 52p. Refs: WHO/EOS/95.17, UNEP/EAP/95.A2.

Report of the International Expert Consultations on the UNEP/WHO GEMS/AIR Programme and the Proposed GEMS/AIR Global Air Pollution Assessment

Meeting Reports series (1994). UNEP and WHO: UNEP Global Environment Monitoring System, Environmental Assessment Programme, P.O. Box 30552, Nairobi Kenya; World Health Organization, Division of Operational Support, Urban Environmental Health, CH-1211 Geneva 27, Switzerland. Pbk, 23p. Ref: UNEP/EAP.MR/94-12.

Soil and Groundwater Pollution: Fundamentals, Risk Assessment and Legislation

Alexander J.B. Zehnder, ed. (1995). Kluwer Academic Publishers, P.O. Box 17, 3300 AA Dordrecht, the Netherlands. Hbk, 164p. ISBN 0-7923-3743-3.

Assessment of the State of Pollution in the Mediterranean Sea by Carcinogenic, Mutagenic and Teratogenic Substances

Mediterranean Action Plan Technical Report N° 92 (1995). Mediterranean Action Plan, UNEP, P.O. Box 18019, Athens, Greece. Pbk, 238p. ISBN 92-807-1467-8.

Epidemiological Studies Related to the Environmental Quality Criteria for Bathing Waters, Shellfish-growing Waters and Edible Marine Organisms

Mediterranean Action Plan Technical Report N° 93 (1995). Mediterranean Action Plan, UNEP, P.O. Box 18019, Athens, Greece. Pbk, 118p. ISBN 92-807-1463-5.

IPCS Environmental Health Criteria publications and Health and Safety Guides

The International Programme on Chemical Safety (IPCS) is a joint venture between UNEP, the International Labour Organisation and the World Health Organization (WHO). Publications in the Environmental Health Criteria (EHC) series review the environmental and health effects of exposure to a chemical or group of chemicals and provide guidelines for setting exposure limits. The Health and Safety Guide (HSG) series facilitates the applications of these guidelines in national chemical safety programmes. The books are in English (those in the EHC series have summaries in French and Spanish), are priced in Swiss francs (shown here) or US dollars, and are available at a discount in developing countries. The series is available from WHO, Distribution and Sales, CH-1211 Geneva 27, Switzerland, and from sales agents for WHO. The most recent titles are:

EHC 165 – Inorganic Lead *(1995). Pbk, 300p. ISBN 92-4-157165-9, SF 43.00.*

EHC 166 – Polybrominated Biphenyls *(1995). Pbk, 324p. ISBN 92-4-157166-7, SF 47.00.*

EHC 172 – Tetrabromobisphenol A and Derivatives *(1995). Pbk, 139p. ISBN 92-4-157172-1, SF 22.00.*

EHC 173 – Tris(2,3-dibromopropyl) Phosphate and Bis(2,3-dibromopropyl) phosphate *(1995). Pbk, 129. ISBN 92-4-157173-X, SF 21.00.*

EHC 174 – Isophorone *(1995). Pbk, 84p. ISBN 92-4-157174-8, SF 18.00.*

EHC 176 – 1,2-Dichloroethane, *2nd edition (1995). Pbk, 84p. ISBN 92-4-157174-8, SF 18.00.*

HSG 92 – Morpholine *(1995). Pbk, 28p. ISBN 92-4-151092-7, SF 5.00.*

HSG 93 – Brodifacoum *(1995). Pbk, 28p. ISBN 92-4-151093-5, SF 5.00.*

HSG 94 – Bromadiolone *(1995). Pbk, 28p. ISBN 92-4-151094-3, SF 5.00.*

HSG 95 – Difenacoum *(1995). Pbk, 28p. ISBN 92-4-151095-1, SF 5.00.*

HSG 96 – Warfarin *(1995). Pbk, 24p. ISBN 92-4-151096-X, SF 5.00.*

HSG 97 – Methomyl *(1995). Pbk, 28p. ISBN 92-4-151097-8, SF 5.00.*

HSG 98 – Chlorothalonil *(1995). Pbk, 32p. ISBN 92-4-151098-6, SF 5.00.*

HSG 99 – Diflubenzuron *(1995). Pbk, 28p. ISBN 92-4-151099-4, SF 5.00.*

NATIONAL/REGIONAL

Umweltbundesamt Annual Report 1994 – Cumulative Abridged Versions of the 1994 Annual Report of the Federal Environmental Agency in English and Russian

Pollution knows no national boundaries. Global environmental hazards have increasingly broad-

ened the dimensions of international environmental policy. This development has also influenced the work of the Federal Environmental Agency (Umweltbundesamt – UBA), the higher federal pollution control authority in Germany. The international exchange of information, particularly with the countries of Central and Eastern Europe, is one of its important tasks.

The Federal Environmental Agency is therefore now presenting cumulative abridged versions of its 1994 annual report in English and Russian. The English- and Russian-language reports, comprising 96 and 112 pages respectively, provide 19 chapters of information about the agency's activities, research it has commissioned, model projects on green technologies, and literature published.

In publishing the English- and Russian-language annual reports the Federal Environmental Agency hopes that the results they contain will be used abroad and that further contacts between staff members of the agency and foreign experts will develop.

(1994). Umweltbundesamt, Bismarckplatz 1, D-14193 Berlin, Federal Republic of Germany. Tel: +49 (30) 89030, Fax: 89 03 22 85. Pbk, 95p.

Environmental Policy in Europe: Industry, Regulation and the Policy Process

François Lévêque, ed. (1995). Edward Elgar Publishing Ltd, Gower House, Croft Road, Aldershot GU11 3HR, UK; Edward Elgar Publishing Company, Old Post Road, Brookfield, Vermont 05036, USA. Pbk, 204p (printers' proof edition).

New Roots: Institutionalizing Environmental Management in Africa

Clement Dorm-Adzobu (1995). World Resources Institute, 1709 New York Avenue, N.W., Washington, D.C. 20006, USA. Pbk, 57p. ISBN 1-56973-037-7. Available from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21211, USA. $16.95 including postage and packing.

Common Measures for the Control of Pollution Adopted by the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution

Mediterranean Action Plan Technical Report N° 95 (1995). Mediterranean Action Plan, UNEP, P.O. Box 180 19, Athens, Greece. Pbk, 69p. ISBN 92-807-1526-7.

National Institute for Environmental Studies Annual Report 1994

(1994). National Institute for Environmental Studies, 16-2 Onogawa, Tsukuba, Ibaraki 305, Japan. Tel: +81 (298) 502 310, Fax: 512 854; E-mail: kokusai@nies.go.jp. Pbk, 124p. Ref: AE-1-'95.

Dutch Social, Scientific and Economic Research on Nature and the Environment: Overview of Current Research and Perspective for the Future in an International Context

S.A. Wink, ed. (1995). Advisory Council for Research on Nature and the Environment (RMNO), P.O. Box 5306, 2280 HH Rijswijk, the Netherlands. Tel: +31 (70) 336 4300, Fax: 336 4310. Pbk, 92p. ISBN 90-72377-14-1.

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Graciela Díaz de Hasson, Carlos E. Suárez & Héctor Pistonesi (1995). Working Paper N° 1, UNEP Collaborating Centre on Energy and Environment, Risø National Laboratory, P.O. Box 49, DK-4000 Roskilde, Denmark. Tel: +45 (46) 322 288, Fax: 321 999. Pbk, 169p. ISBN 87-550-2018-6.

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Renewable Energy Development in India: Analysis of US Policy Experience

P. Venkata Ramana & Keith Kozloff, eds. (1995). Tata Energy Research Institute, Darbari Seth Block, Habitat Place, Lodi Road, New Delhi 110 003, India. Pbk, 153p. ISBN 81-85419-12-4. $32.95 including postage.

Planning for the Indian Power Sector: Environment and Development Considerations

(1995). Canadian Energy Research Institute (CERI) & Tata Energy Research Institute (TERI). CERI, #150, 3512-33rd Street N.W., Calgary, Alberta, Canada T2L 2A6. Tel: +1 (403) 282 1231, Fax: 284 4181. TERI, Darbari Seth Block, Habitat Place, Lodi Road, New Delhi 110 003, India. Pbk, 365p. ISBN 81-896091-02-4. $80.00 including postage.

Pollution Control Acts, Rules and Notifications Issued Thereunder

Third edition (1995). Central Pollution Control Board, Ministry of Environment and Forests, Government of India, Parivesh Bhawan, East Arjun Nagar, Delhi 110 032, India. Hbk, 501p. ISBN 81-86396-18-7.

The Automotive Industry: Growth and Prospects

Association of Indian Automobile Manufacturers, Core 4B, Zone IV, 5th Floor, India Habitat Centre, Lodi Road, New Delhi 110 003, India. Tel: +91 (11) 464 7810, Fax: 464 8222. Pbk, 32p.

Environmental Considerations and Options in Managing India's Long-term Energy Strategy

This report deals with a set of issues that will be of increasing importance in India's future development strategy. It is always difficult to incorporate the diverse concerns and considerations that guide the complex set of policies inherent in energy decision-making in any society, but in the case of India the task is particularly difficult. First, there are economic considerations that require rapid growth of energy supply and consumption to fuel the developmental activities necessary for alleviating poverty. Secondly, there are marked differences in patterns and levels of energy consumption across different sections of Indian society, excessive reliance on biomass energy forms in rural areas, and rapid growth in the consumption of conventional forms such as petroleum products and electricity in the transport and industrial sectors. These two types of supply and consumption patterns imply very different sets of environmental problems. For instance, in rural areas burning of very low calorific value fuels in homes, generally without proper ventilation, leads to high levels of indoor pollution. In the industrial sector, energy use leads to environmental impacts along an extensive cycle which often starts with coal mining and includes coal transportation, power generation and disposal of fly ash, all of which have adverse impacts on the environment.

This study covers the linkage of energy activities with macroeconomic variables, and then addresses issues related to energy reserves and production and trends in energy consumption in various sectorial components including major industry groups, the transport sector, households and agriculture. It provides a detailed analysis of the environmental impacts of energy production and use, ranging from land degradation to the environmental effects of nuclear power plants and the effects of energy use on the environment in a number of industrial activities. Since the purpose of the report is to help develop a set of energy policies consistent with environmental goals, it covers future prospects of energy consumption and supply and discusses and evaluates an optimal energy path, both on a business-as-usual basis, as well as scenarios developed by incorporating environmental considerations through a set of policies and strategies that are discussed in extensive detail.

In a country as large and diverse as India, aggregate analysis often fails to convey the reality. This study therefore focuses on specific case studies at the micro level which help concentrate on

the issues that are the building blocks, and hence an important part, of macroeconomic considerations, but that may not be revealed if only aggregate analysis is used to draw important conclusions. These case studies support policy considerations that are analysed and discussed in the report. A careful blending of the conclusions from the macro analysis and the case studies has been attempted in defining the strategies developed.

The report, in essence, presents a set of policy measures and action plans that would underlie an energy development path for the future that is supportive of the objectives of growth, so vital for the alleviation of poverty in India, but also provides environmentally sustainable solutions that would in turn support the welfare of Indian society.

(1995). UNEP and Tata Energy Research Institute, Darbari Seth Block, Habitat Place, Lodi Road, New Delhi 110 003, India. Pbk, 241p. ISBN 81-85419-14-0, $29.95 + postage.

INDUSTRY SECTORS

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(1995). Concawe, Madouplein 1, B-1030 Brussels, Belgium. Tel: +32 (2) 220 3111, Fax: 219 4646. Pbk, 19p. Report N° 4/95.

The Chemical Industry in 1994: Annual Review – Production and Trade Statistics 1991-1993

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International Workshop on Phasing Lead out of Gasoline – Proceedings

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(1995). The Finnish Pulp and Paper Research Institute, P.O. Box 70, SF-02151 Espoo, Finland. Pbk, 459p. ISBN 952-90-6454-3.

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(1996). Organisation for Economic Co-operation and Development, 2 rue André-Pascal, 75775 Paris Cedex 16, France. Fax: +33 (1) 45 24 16 75. Pbk, 121p. OECD Environment Monograph N° 106, ref: OCDE/GD(96)13. Free of charge.

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(1995). Organisation for Economic Co-operation and Development, 2 rue André-Pascal, 75775 Paris Cedex 16, France. Fax: +33 (1) 45 24 16 75. Pbk, 486p. OECD Environment Monograph N° 108, ref: OCDE/GD(95)126. Free of charge.

INDUSTRIAL ENVIRONMENTAL MANAGEMENT

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David Saphire (1995). Inform, 120 Wall Street, New York, NY 10005-4001, USA. Tel: +1 (212) 361 2400, Fax: 361 2412, E-mail: inform@igc.apc.org. Pbk, 72p. ISSN 1050-8953.

RESOURCES MANAGEMENT

Global Biodiversity Assessment: Summary for Policy-Makers

The GBA is an independent, peer-reviewed, scientific analysis and assessment of biological and socio-economic aspects of biodiversity. It was commissioned by the United Nations Environment Programme (UNEP) and funded by the Global Environment Facility (GEF).

This Summary for Policy-Makers presents the main conclusions drawn by the assessment, with an emphasis on those aspects that will be of interest to policy-makers.

R.T. Watson and others (1995). Cambridge University Press, Trumpington Street, Cambridge CB2 1RP, UK; 40 West 20th Street, New York, NY 10011-4211, USA; 10 Stamford Road, Oakleigh, Melbourne 3166, Australia. Pbk, 46p. ISBN 0-521-56480-8.

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IHP/OHP-Sekretariat, Bundesanstalk für Gewässerkunde, P.O. Box 309, 56003 Koblenz, Germany. Pbk, 720p.

Protection and Sustainable Use of Waters: Recommendations to ECE Governments

(1995). United Nations Economic Commission for Europe, Geneva, Switzerland. Pbk, 48p. ISBN 92-1-116627-6, Water Series N° 2.

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Andrew S. Fraser, Michel Meybeck & Edwin D. Ongley (1995). UNEP, P.O. Box 30552, Nairobi, Kenya. Pbk, 40p. UNEP Environmental Library N° 14.

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(1995). Stockholm Vatten AB (Stockholm Water Company), Stockholm, Sweden. Pbk, 249p. ISBN 91-971929-8-8.

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Balancing Acts: Community-Based Forest Management and National Law in Asia and the Pacific

Owen J. Lynch & Kirk Talbott (1995). World Resources Institute, 1709 New York Avenue, N.W., Washington, D.C. 20006, USA. Pbk, 188p. ISBN 1-56973-033-4. Available from WRI Publications, P.O. Box 4852, Hampden Station, Baltimore, MD 21211, USA. $25.95 including postage and packing.

Report of the UNEP/RIVM Workshop on UNEP's Pilot Global Environment Outlook Project Focusing on Land Degradation and Food Production

Meeting Reports series (1995). UNEP Environmental Assessment Programme, P.O. Box 30552, Nairobi Kenya. Pbk, 41p. Ref: UNEP/EAP.MR/95-4.

TECHNOLOGY/SERVICES

Water Management International 1996: The Annual Review of the Water and Wastewater Industry

Robin Wiseman, ed. (1995). Sterling Publications, 55a North Wharf Road, London W2 1XR, UK. Pbk, 232p. ISSN 1360-8307.

International Directory of Solid Waste Management 1995/6: The ISWA Yearbook

Jeanne Moller, ed. (1995). James & James Science Publishers, Waterside House, 47 Kentish Town Road, London NW1 8NZ, UK. Pbk, 480p. ISBN 1-873936-43-5.

Powder and Bulk Solids Handling and Processing: The 1995/96 Yearbook and Directory

(1995). Trans Tech Publications Ltd, P.O. Box 1254, Frieberger Strasse, D-38670 Clausthal-Zellerfield, Germany. Fax: +49 (53) 23 96 97 96. Pbk, 256p. ISBN 0-87849-098-1, $82.00/DM 110.00.

EDITIONS FRANÇAISES TITULOS ESPAÑOLES

Problèmes d'environnement : dires d'experts

Pour donner à chacun - citoyens, entreprises, organismes scientifiques, pouvoirs publics, associations... – une vision claire et globale de ces problèmes et de leurs conséquences, Entreprises pour l'Environnement a réuni dans cet ouvrage les contributions de scientifiques reconnus.

Ces 20 textes couvrent 15 thèmes principaux : l'effet de serre, l'ozone stratosphérique, la désertification et la déforestation, les ressources génétiques et la biodiversité, les risques biotechnologiques, la pollution des océans, le nucléaire civil, la pollution de l'air, la pollution des eaux continentales, les accidents industriels majeurs, les déchets industriels et ménagers, l'urbanisation, le bruit, la surpopulation, les transports.

Ce volume apporte une contribution essentielle pour une meilleure compréhension de ces phénomènes. Il permet une approche globale aisée grâce à des fiches reprenant de manière synthétique et concise les principaux domaines développés dans cet ouvrage.

(1996). Entreprises pour l'Environnement, 5 Esplanade Charles de Gaulle, 92733 Nanterre Cedex, France. Tél: +33 (1) 47 24 64 55, Fax: 47 24 61 77. Poche, 288p. ISBN 2-9508030-2-4.

Atelier sous-régional sur la qualité des eaux

Cet atelier s'est déroulé du 20 au 24 mars 1995 à l'Ecole Inter-états de l'Equipement Rural (EIER) de Ouagadougou. Huit pays africains étaient représentés (Sénégal, Mali, Burkina Faso, Niger, Côte d'Ivoire, Togo, Bénin, Zaïre). Le rapport présente les actes de l'atelier.

Outre les présentations techniques concernant les paramètres de la qualité de l'eau dans le programme GEMS/EAU, les données sur les eaux de surface et les eaux souterraines particulièrement en Afrique, le programme de contrôle de la qualité analytique, la présentation des résultats, le traitement analytique, le logiciel RAISON, chaque participant national a présenté le programme national de contrôle de la qualité des eaux qu'il soit participant (Sénégal, Mali, bientôt Niger), bientôt participant (Burkina Faso, Côte d'Ivoire) ou futur participant (Bénin, Togo, Zaïre).

Meeting Reports series (1995). UNEP Environmental Assessment Programme, P.O. Box 30552, Nairobi Kenya. Poche, 136p. ref: UNEP/EAP.MR/95-14.

La gestion des déchets

Facteurs de risques pour l'environnement, les déchets, en augmentation constante, envahissent notre planète.

Traitement et valorisation sont à l'ordre du jour, mais pour Philippe Pichat, ingénieur et spécialiste d'innovations technologiques liées aux déchets, beaucoup de travail reste à faire, non seulement sur le plan des collectivités, mais aussi, et peut-être plus encore, à titre individuel.

Philippe Pichat (1995). Flammarion. Poche, 124p. ISBN 2-08-35247-4.

Bien gérer votre commune aujourd'hui pour le 21e siècle : un guide pratique sur le développement durable local adressé à tous les Maires de France

Dans le cadre de ses actions de sensibilisation pour la protection de l'environnement en France et la promotion du développement durable, le Comité 21 publie un guide pratique sur le développement durable local.

Cet ouvrage, offert à tous les Maires de France, a pour ambition de mettre ainsi à leur disposition à la fois des suggestions et des éléments de référence utiles pour la mise en oeuvre d'actions concrètes. Il peut servir d'inspiration à d'autres maires dans le monde.

Il a, en effet, été convenu, dans la ligne des engagements du Sommet de Rio, que toutes les collectivités élaborent un « Agenda 21 local ». Cette action constituera l'un des éléments forts de la prochaine conférence des Nations Unies sur les Villes prévue en juin prochain.

(1995). Comité 21, 11 bis, rue Portalis, 75008 Paris, France. Tél: +33 (1) 44 90 88 95, Fax: 44 90 88 94. Poche, 32p. ISBN 2-911520-00-9, FF 100.00.

Dixeco de l'environnement

Le Dixeco de l'environnement est un lexique des principaux termes et concepts de l'environnement.

A l'aide d'une approche systémique et pluridisciplinaire (écologie, économie, géographie...), il éclaire les réalités sociales et techniques des rapports entre l'homme et son milieu. Il permet à chacun, par la compréhension des phénomènes environnementaux, d'agir dès à présent pour une meilleure qualité de la vie.

Le Dixeco de l'environnement, comme tous les ouvrages de la collection DIXECO, a été conçu sur la base des questions posées lors de formations organisées par CENECO sur les problèmes économiques qui se posent au citoyen d'aujourd'hui.

(1995). CENECO, B.P 27, 78290 Croissy-sur-Seine, France. Tél: +33 (1) 39 76 47 66, Fax: 39 76 39 65. Poche, 262p. ISBN 2-86911-364-1, FF 95.00.

Stratégies d'utilisation rationelle de l'énergie en Afrique de l'Ouest

Face aux problèmes énergétiques et environnementaux des pays de l'Afrique de l'Ouest, comment développer des stratégies d'utilisation rationnnelle d'énergie qui reposent sur la diversité des solutions locales ? Mais d'abord, quelles sont les conséquences de l'utilisation de telles stratégies ? Cet ouvrage présente, au travers d'une analyse des spécificités propres à sept pays d'Afrique occi-

dentale, des enseignements utiles pour tous ceux qui s'intéressent aux problèmes d'environnement et de développement du tiers monde.

(1995). Enda Tiers-Monde, B.P. 3370, Dakar, Sénégal. Tél: +221 22 42 29, Fax: 23 51 57. Poche. 122p. ISBN 92-9130-007-1.

Atelier international sur l'électrification rurale décentralisée: actes de l'atelier

UNDP, Cooperation Française/Ademe, 27, rue Louis Vicat, 75737 Paris Cedex 15, France. Poche, 438p.

La qualité de l'air en France en 1993-94 : données et références

Rémi Stroebel (1995). Ademe, Direction Prospective, Programmation, Evaluation, 27, rue Louis Vicat, 75015 Paris. Poche, 235p. ISBN 2-86817-149-4, FF 250.

Le droit communautaire et les déchets

Nicolas de Sadeleer (1995). LGDJ, 14, rue Pierre et Marie Curie, 75005 Paris, France. Tél: +33 (1) 44 41 97 10, Fax: 43 54 78 21; Bruylant, rue de la Régence 67, 1000 Bruxelles, Belgique. Tél: +32 (2) 512 9845, Fax: 511 7202. Poche, 671p. ISBN 2-8027-0654-3.

Guide de la sécurité des entreprises et des collectivités

(1995). CNPP, 5, rue Daunou, 75002 Paris, France. Tel: +33 (1) 44 50 57 60, Fax: 44 50 57 99. Poche, 424p. ISSN 0990-8498. Face au risque N° 318, Cahier N° 2.

Manual de Minimización de Residuos y Emisiones Industriales para las Industrias Transformadoras de los Metales del Sector Metal

(1995). Confederación de la Pequeña y Mediana Empresa Aragonesa; Gobierno de Aragon, Departamento de Agricultura y Medio Ambeinte. Cubierta blanda, 65p.

Aspectos Geologicos de Proteccion Ambental

Volumen I, Fernando L. Repetto & Cláudia Santiago Karez, Editores (1995). UNESCO: Oficina Regional de Ciencia y Tecnología de la UNESCO para América Latina y el Caribe, Casilla de Correa 859, Montevideo, Uraguay. Cubierta blanda, 245p. ISBN 92-9089-047-2.

Emergency Preparedness for Chemical Hazards

Drawing on experience, the Indian Ministry of Environment and Forests has published a document called *Manual on Emergency Preparedness for Chemical Hazardous Substances*. The objectives of any emergency preparedness is to be in a state of readiness to face the adverse effects of accidents caused by hazardous substances. An Emergency Preparedness Plan (EPP) has to be prepared for every district or industrial area as appropriate. Such a plan must, *inter alia*, cover the possible hazardous situations in the locality and the causes, areas most likely to be affected, on-site and off-site plans, establishment of Emergency Control Centres (ECC), location of emergency services, and duties of officers/staff during emergency. The EPP document for chemical accidents will be designed to provide for measures to contain the incident and for minimization of effects due to fire, explosives, release or escape of toxic gas, spillage of hazardous substances in storage, processing, transportation, and the like. The necessary preventive and protective steps required to be taken before, during and after the accident need to be worked out in operational terms and detailed in the EPP document.

The purpose of this manual, in brief, is to assist owners or occupiers of sites of hazardous chemicals, and district authorities concerned, in regard to the following aspects of emergency preparedness:

1. planning and adopting a systematic approach to emergency management in the district by correlating details of industrial site plans with elements of off-site plans identified and listed in the manual;
2. preparation of on-site emergency plans by individual industries, storage units, etc. as required under national law;
3. preparation of off-site emergency plans as stipulated in hazardous chemical regulations and rules;
4. preparation of plans for meeting emergencies due to accidents during transportation of hazardous chemicals.

The following is a summary of the Planning for Chemical Emergencies and Risk Management chapters of the manual.

Planning process

In order to avoid or prevent and contain chemical emergencies, both on-site and off-site, and to mitigate their adverse effects, location or area-wise comprehensive planning is essential. Planning for such an emergency, which the Emergency Preparedness Plan seeks to achieve, should encompass all stages of operation of a chemical plant or factory or process, storage and transportation. With every change or modification made at a factory, or in an operation or process, the EPP may have to be modified and updated to keep it meaningful and effective. These modifications are to be taken care of in the on-site emergency plan by the unit itself first, and then reflected in the off-site plan for the locality or area by the district authority for the EPP.

Planning during conceptual stage

Proper planning at the conceptual stage of a chemical unit helps enhance the safety of the plant and workers, boost production, and increase efficiency. Thus it eventually helps to minimize loss of life and property, which are the direct consequences of accidents. While planning at this stage would have to be made for the new installations dealing with hazardous chemicals, for the existing industries this would be relevant only for modification, renovation or expansion activities. In order to achieve the above, the following needs to be taken note of:

- risks associated with the process technology;
- safety measures;
- siting of industry;
- layout of the plant;
- emergency preparedness; and
- compliance with the regulatory requirements.

Risks associated with the process technology

Apart from economic consideration of the process technology, risks associated with the technology under consideration need to be evaluated. For any new installation process, a technology with the minimum possible risk would no doubt be the desirable one for sound EPP. In addition to safe design of the plant, the common risks associated with the process technology include use of hazardous/toxic/carcinogenic substances as raw materials, handling processes, process parameters and operation.

Safety measures

After selection of process technology, the essential safety devices must be incorporated in the on-site plan as stipulated under the Factories Act and the Hazardous Chemicals Rules. In selecting these devices, suitability and reliability of equipment/instruments should be ensured. Human and material resources like firefighting facilities, protective equipment, and health services are part and parcel of safety measures. Casualties in a number of on-site accidents at chemical installations could have been minimized, if not avoided, if the resources for safety measures had been properly maintained.

Table 1
Hazard analysis components

1. Hazard identification	2. Vulnerability analysis	3. Risk analysis
chemical identity	vulnerable zone	likelihood of a release occurring
location	human population	
quantity	critical facility	severity of the consequences
nature of hazard	environment	

Siting of industry

It has to be ensured that the hazardous unit is not located in a densely populated area. The occupier of any proposed chemical installation should select a site based on a preliminary hazard analysis of the process technology being adopted. Preliminary hazard analysis would indicate the vulnerable zone in and around the factory. Having considered all possible measures to reduce this vulnerable zone, a site should be selected which, in the event of an accident, would lead to minimum damage to human beings and the environment outside the factory premises. For the existing installations, however, this has to be evaluated only in the case of any expansion or modification proposed.

Layout of the plant

After selection of the site of a new installation, or for any proposed expansion or modification of an existing unit, it is necessary to plan for proper layout of the plant, which essentially means locating the processing plant, storage, administrative building, control room, etc. A proper layout should aim at reducing the chances of an off-site spill or an on-site accident and, at the same time, minimizing on-site damage.

Emergency preparedness

1. Assessing the hazard potential of an installation is the first step in planning for emergencies. Hazard Analysis is discussed in detail in Chapter 3 of the Manual. Preliminary Hazard Analysis (PHA), which comprises hazard identification and vulnerability analysis, should always be carried out at the conceptual stage for all installations including small and medium ones. However, Major Accident Hazard (MAH) installations, both existing and proposed, will have to carry out a risk analysis. Techniques like Hazard and Operability (HAZOP), Fault Tree, Event Tree and Failure Modes, Effects and Criticality Analysis (FMECA), etc. have been developed for this purpose.

2. Drawing up of plans to prevent and control emergencies, as well as to mitigate the consequences of an accident, is the next step. Elements of an on-site plan, its preparation and execution are detailed in Chapter 4 of the manual. Apart from being a regulatory requirement, careful planning helps in avoiding accidents and minimizing the likely effects.

3. The occupier, while planning for emergencies, should bear in mind that all efforts should be made to prevent an accident in the first instance. No efforts should be spared to contain an accident within the factory premises. Spills outside the factory result in huge loss of life and property and damage the environment, as well as increasing civil liabilities. It is therefore essential that an on-site emergency plan be based on a maximum loss scenario, and that all resources be mustered and planned for to contain such accidents within the site. Events that cannot be contained on-site, in spite of the best efforts made by the occupier, should be reported to the District Collector. The occupier will have to provide full details of such incidents along with their nature to the District authorities: the causes, consequences, resources available on-site, and public awareness that would be required in addition to what the occupier can mobilize to face such a situation.

Planning during erection and commissioning of the plant

Having selected the least-risk technology and the site, and finalized the layout of the plant, the occupier should ensure proper erection and commissioning. Adequate redundancy for critical safety equipment/accessories needs to be built in. Their installation and commissioning also needs to be monitored.

It is always necessary to scrupulously follow the process design and parameter selected without trying to bypass or switch off trips during commissioning. Safety in operation greatly depends on proper commissioning of the plant. The utmost care should be taken to monitor every aspect of erection, maintenance or other areas which require proper planning. A control room to deal with emergencies needs to be commissioned. A team of responsible officers also needs to be constituted, with their duties for emergencies duly assigned.

Planning during operation of the plant

Accident-free operation is the outcome of strict adherence to safety norms. Having planned for the minimal risk technology and erection and commissioning, operators and workers need to be trained and made aware of various safety requirements. Plans should be chalked out for induction of safety-conscious workers, with training of such personnel arranged regularly. Mock drills and rehearsals need to be planned and conducted periodically. Records of all such drills and proceedings not only need to be maintained, but should also be reviewed for the purpose of effecting improvements.

Central Crisis Group (CCG) alert system

The Ministry of Environment and Forests is the nodal ministry for management of chemical disasters in India. In order to respond adequately during a major chemical emergency, a coordinated effort at the local, state and central levels is needed. All available resources need to be mobilized to deal with the crisis in the shortest possible time with the least adverse effects. With this aim in view, a Central Crisis Group has been constituted. The Joint Secretary in the Ministry of Environment and Forests responsible for Hazardous Substance Management is the Member Secretary of the CCG. The Group functions under the chairmanship of the Union Secretary (Environment and Forests). Similarly, a Standing State Crisis Group and the District Level Co-ordination Committees will have to be constituted in every State and at district levels, respectively. A Red Book detailing the functions and composition of the CCG, as well as the experts available in the country, has been issued by this ministry. It is updated periodically and distributed to all concerned.

Hazard analysis

Hazard analysis is a critical component of emergency planning. To analyse the safety of a major installation, as well as its potential hazards, a hazard analysis should be carried out covering the following areas:

1. toxic, reactive, explosive or flammable substances in the installation which constitute a major hazard;
2. failures or errors which could cause abnormal conditions leading to a major accident;
3. the consequences of a major accident for workers, people living or working outside the installation, and the environment;
4. preventive measures for accidents;
5. mitigation of the consequences of an accident.

The information developed on hazard analysis provides both the factual basis to set priorities for planning and the necessary documentation for supporting planning and response efforts. The three basic components of hazard analysis are: 1) hazard identification, 2) vulnerability analysis, and 3) risk analysis. These steps should be followed sequentially, even though the level of details will vary from site to site. Details of various components are shown in **Table 1**.

As a first step, a Preliminary Hazard Analysis (PHA) should be carried out to identify potential accidents such as toxic release, fire, explosion or release of flammable material and to check the fundamental elements of the safety system. PHA should be summarized in documentation covering each accident considered and the relevant component (storage vessel, reaction vessel, etc.). The results of PHA should indicate which units or procedures within the installation require further and more detailed examination, and which are of less significance from a major hazard point of view.

Hazard identification

Hazard identification is the first step in hazard analysis. It entails the process of collecting information on:

- the types and quantities of hazardous chemicals in production, storage, processing, transportation and disposal in an installation;
- the location of the facilities – process, storage, product or use; and
- potential hazards associated with spills or releases.

Procedure for hazard identification

1. Identification of hazardous substances

Chemicals can be identified either by their CAS numbers or their ID (UN) numbers. Based on the respective criteria, chemicals can be classified as toxic, flammable or explosive.

2. Quantities of hazardous substances

The estimation of the notifiable quantity of each chemical at a site should include the amounts likely to be on-site under the control of the occupier. It should include the following:

a. activities involving storage, manufacture and use in process;

b. vehicles used exclusively for on-site transportation, since any quantity such a vehicle is carrying is liable to be either stored or used in the installation;

c. any vehicle, for example road or rail tanker, used as a storage vessel either on-site or within 500 metres of the site;

d. any off-site pipeline which is within 500 metres of the site boundary and connected to it. This would include pipeline used for transfer operations to and from a remote outlet. It could also include road tankers, ships, or other vessels.

e. any neighbouring site within 500 metres of any part of the boundary storing, processing or handling the same hazardous chemical.

3. Hazardous substances that exceed Threshold Planning Quantity (TPQ)

For the benefits of the occupier, threshold planning quantities which require preparation of an on-site emergency plan have been indicated in the Rules. The basis for establishing threshold planning quantity has been the size of the area within which human life is seriously endangered by the consequences of an instantaneous release of the substances. Occupiers are advised that while assessing whether their installation is subject to the preparation of an on-site plan, they should take into account the maximum anticipated quantity of the substances at any point in time at the installation. An occupier processing any hazardous chemical at or above the threshold planning quantity indicated in the Rules is required to prepare an on-site emergency plan.

4. Information on the location and conditions under which the chemicals are processed, handled or stored greatly helps in the risk analysis step of hazard analysis. The storage hazard potential will vary considerably in terms of its effects on the neighbouring environment and on other storage nearby (cascading effect). Temperatures and pressures, and other aspects of storing and handling hazardous chemicals, also play an important role.

Risk analysis

Risk analysis is the third part of the hazard analysis process. It can provide a relative measure of the likelihood and severity of various possible hazardous events and enable the emergency plan to focus on the greatest potential risks. Risk analysis requires certain information collected during the first two steps of the hazard analysis (hazard identification and the vulnerability analysis), as well as other information specific to the facility. A quantitative risk assessment is not deemed essential to performing a hazard analysis suitable for emergency response planning in most cases. The real value of risk analysis derives from the fact that it gives the occupiers and planners the ability to put each potential situation into perspective (in terms of the probability that it will occur and the effects, including cascading) and results in emergency plans that address the most likely and most severe potential hazards.

Overall approach to risk analysis: ranking of hazards

Risk analysis includes an estimate of the probability or likelihood that an event will occur. Estimation of random incidents totally unconnected with plant activities may also be made. Risk can be characterized in qualitative terms as high, medium or low, or in quantitative terms using numerical estimates and statistical calculations. For practical purposes, a risk analysis may be based on a subjective, common-sense evaluation. Both probability and consequences are extremely important in risk evaluation. A high-risk situation can be the result of a high probability with severe consequences (e.g. irreversible health effects or death due to an airborne toxic chemical, a fire, or explosion with injuries or fatalities), whereas moderate risk situations can be a result of either high probability with mild consequences or low probability with more severe consequences. Diminishing the likelihood of an accident or minimizing the consequences will reduce overall risk.

A relative ranking of hazards requires extensive mathematical evaluations, application of statistics, and extensive support from experts. Application of readily available information and common sense, when combined with site-specific evaluations such as the vulnerability analysis, will complete much of the risk analysis process.

Sophisticated techniques for evaluating hazards

The need for sophisticated techniques to evaluate hazards depends on the result of preliminary hazard analysis. Various techniques for evaluating hazards are:

1. Hazard and Operability Study (HAZOP);
2. Accident Consequence Analysis;
3. Event Tree Analysis;
4. Fault Tree Analysis;
5. Failure Modes, Effects and Criticality Analysis.

Source

Manual on Emergency Preparedness for Chemical Hazardous Substances. Management Division, Ministry of the Environment and Forests, New Delhi, India (1992).

AWARE is prepared and published in collaboration with UNEP's International Register of Potential Toxic Chemicals (IRPTC). Comments on the present series of AWARE articles are welcome and should be sent directly to UNEP/IRPTC, 15 Chemin des Anémones, Case postale 356, Châtelaine, CH-1219 Geneva, Switzerland.

Thank you!

The contents of the *Industry and Environment* review bring benefits to participants in various environmental training courses in Rajasthan and other provinces of India. I owe this credit to the generous and very kind willingness of UNEP IE to consistently send me issues of the review.

Once again, I acknowledge with heartfelt gratitude the readiness of your office to provide me with this literature of incalculable value to all people on our Mother Earth.

S.K. Misra
13/387 Malyiya Nagar
Jaipur 302017
India

It has been quite some time since I came across such a juicy issue with such a variety of topics, a galaxy of authors from all over the world, and superb production.

Having worked on editing periodicals ages ago, I am well aware of the painstaking effort, patience and perseverance behind such a remarkable achievement. You and your team have every reason to be proud of the outcome. By the same token, you have now set yourselves a high standard that your readership will always expect from you.

Most sincere congratulations and many thanks for the benefit and pleasure I – like everyone else – have gained. Keep up the good work.

O. A. El-Kholy
13, Str. 265 New Maadi
Cairo, Egypt 11742

THE ROLE OF UNEP INDUSTRY AND ENVIRONMENT

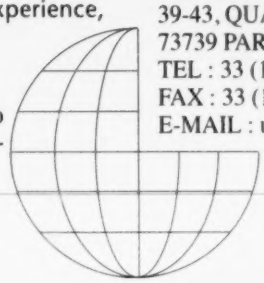
It is now widely accepted that sustainable development and a sound environment go hand-in-hand. UNEP recognized this as early as 1975 when it established the Industry and Environment centre (IE), located in Paris. UNEP IE functions as a catalyst to bring industry, government and non-governmental organizations together to work towards environmentally sound forms of industrial development. UNEP IE seeks to:

- define and encourage the incorporation of environmental criteria in industrial development;
- help formulate policies and strategies for sustainable industrial development and facilitate their implementation;
- promote preventive environmental protection through cleaner production and other pro-active approaches; and
- stimulate the exchange of information on environmentally sound forms of industrial development.

To achieve these goals, UNEP IE has developed programmes in the fields of Awareness and Preparedness for Emergencies at Local Level (APELL), Cleaner Production, Tourism and Transport, and other sector-specific activities. The Ozon-Action Programme, under the multilateral Fund is also based at UNEP IE. UNEP IE organizes conferences and seminars, undertakes training activities and demonstration projects, and produces practical supporting publications.

To promote the transfer of information and experience, UNEP IE has developed:

- The *Industry and Environment* quarterly review;
- A *Query-Response Service*, which responds to specific technical queries on a wide range of subjects related to industrial pollution;
- *Outreach Activities*, which address a broad range of issues concerning industry as a whole. UNEP IE develops partnerships with industry, government and non-governmental organizations, organizes consultative meetings, and publishes supporting documents aimed at spreading new developments in the field of sustainable development.
- A *Technical Report Series* and other publications, which provide practical information to readers throughout the world. Recent titles include *Cleaner Production Worldwide, Hazards Identification in the Local Community, From Regulations to Industry Compliance: Building Institutional Capabilities, Audit and Reduction Manual for Industrial Emissions and Wastes, Companies Organization and Public Communication on Environmental Issues*, and many others. For a complete list of available publications, please contact UNEP IE.



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If you would like to respond to something you've read in these pages — to agree or to take issue with a point of view, to clarify a point of fact, or to provide information on a particular aspect — write to us. If you would like to air your views on any other subject relevant to ***Industry and Environment***, we would like to hear from you. As space is limited, we cannot guarantee to publish all letters, nor to publish long ones in full.

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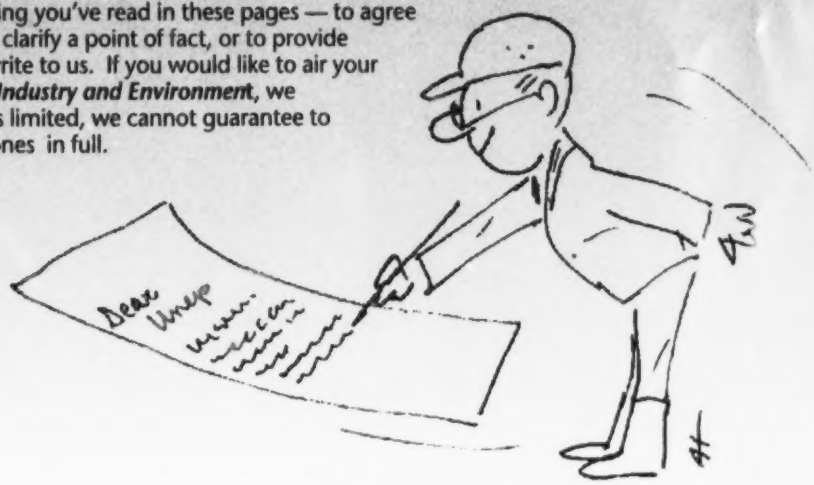

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For more than fifteen years, the ***Industry and Environment*** quarterly review has provided a forum for the exchange of research and experience, presenting articles written by and for industry managers, government officials and researchers in the field of sustainable industrial development. In addition to features, news and developments of broad international interest, each issue of the review focuses on a particular theme. Recent issues have covered such varied topics as climate change and industry, education and training, managing contaminated land, transport, and sustainable tourism development. For a complete list of past issues and their availability, contact UNEP IE.

The next issue of ***Industry and Environment*** will focus on the theme of the construction industry and the environment.

While ***Industry and Environment*** is an English language publication, it also includes articles in French and Spanish. All contributed articles are preceded by summaries in English, French and Spanish.

环境署

The review is now also available in Chinese translation. For further details, please contact:
Professor Chen Dingmao, Research Center for Eco-Environmental Sciences, Academia Sinica, P.O. Box 2871, Beijing 100085, China.

***INDUSTRY AND ENVIRONMENT* SUPPLEMENTS**

The ***Industry and Environment*** review includes three semi-annual supplements, the *APELL*, *Cleaner Production* and *EnTA* newsletters.

UNEP IE's APELL programme – Awareness and Preparedness for Emergencies at Local Level – seeks to minimize the occurrence and impact of industrial accidents. This newsletter keeps readers up-to-date on APELL programmes currently in progress around the world.

Cleaner Production

The Cleaner Production newsletter provides information on cleaner technologies and products, actions by governments and organizations to promote cleaner production, and the UNEP IE Cleaner Production activities and network.

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